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ABSTRACTS OF ARI RESEARCH PUBLICATIONS
FY 1980

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A Field Operating Agency under the Jurisdiction of the
Deputy Chief of Staff for Personnel

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ABSTRACTS OF ARI RESEARCH PUBLICATIONS

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Abstracts

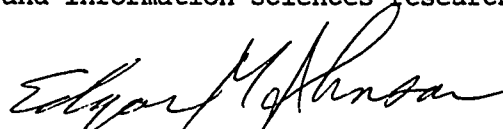
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FOREWORD

The Army Research Institute for the Behavioral and Social Sciences (ARI) publishes a series of abstracts that summarize the research on which final or interim reports have been published during each fiscal year. The series began in 1957. This Technical Report contains the abstracts for Research publications for FY 1980, October 1979 to September 1980.

During this period, ARI was the Army's agency for behavioral and social science research and a field operating agency under the Office of The Deputy Chief of Staff for Personnel. Independent laboratories and supporting operational field units working together provided a flexible research program on personnel utilization, training and evaluation, leadership and management, simulation systems, manpower and educational systems, human factors in systems integration, state-of-the-art computer technology, and information sciences research for the modern Army.


EDGAR M. JOHNSON
Technical Director

ABSTRACTS OF ARI RESEARCH PUBLICATIONS, FY 1980

CONTENTS

	Page
INTRODUCTION	1
Publication Categories	1
Distribution of ARI Publications	2
ABSTRACTS OF RESEARCH PUBLICATIONS	3
Research Reports	3
Technical Papers	7
Technical Reports	8
Research Notes	19
Research Products	31
INDEX	45
DEPOSITORY LIBRARIES	49

ABSTRACTS OF ARI RESEARCH PUBLICATIONS, FY 1980

INTRODUCTION

The present volume of abstracts, continuing the series begun in 1957, summarizes the research publications of the Army Research Institute for the Behavioral and Social Sciences (ARI) for the fiscal year 1980. Each volume of the series provides a synopsis of research efforts which reached publication stage during the period covered. The abstracts have been written, as far as possible, to describe the principal research findings in nontechnical terms; technical language is used to communicate efficiently the details of research analysis. Indexing by author and research area provides access to individual reports and topics.

Publication Categories

ARI Research publications are divided into separate, consecutively numbered categories appropriate to their intended audience and function. In FY 1980 the following categories of technical documentation were represented:

Research Report: A report of completed research intended primarily for dissemination to military managers. Research Reports may deal with policy-related issues but typically do not include specific policy recommendations.

Technical Papers: Research oriented, they present technical information on research methodology or basic psychological knowledge developed out of the ARI work program. They are primarily of interest to technically trained research workers in the Defense Department and other government agencies. The designation of the series was changed from Technical Paper to Technical Report, beginning at Technical Report 386; the numbers continue in sequence.

Technical Report: A report of completed research intended primarily for dissemination to researchers. Technical Reports should closely approximate journal articles in outline, technical scope, and level of detail.

Research Note: This may be either an interim or a final report, but is typically of limited interest outside of ARI and is not printed or distributed except to Defense Technical Information Center. Included in this category are in-house reports and appendix materials to Research or Technical Reports.

Research Product: A user-oriented document intended for distribution to field personnel. Examples are handbooks, manuals, and guidebooks. Non-textual materials which are intended to be part of a Research Product, such as computer cards, electronic storage discs, video or audio tapes or cassettes, and special types of packaging, should ideally be a contract "deliverable" and not something which needs to be duplicated by ARI as a separate effort.

Distribution of ARI Publications

Initial distribution of these reports was made directly by ARI. Research Reports, Technical Reports, and Research Products were distributed primarily to operational and research facilities and their sponsors in the Defense Department, to other interested Government agencies, and to the Defense Technical Information Center (DTIC), and were also sent to the Library of Congress, which sends documents to Federal depository libraries. Research Notes were deposited in DTIC, and are available only from DTIC or its coordinating agency, the National Technical Information Service (NTIS), in hardcopy or microfiche.

Qualified requesters may obtain copies of reports deposited in the Defense Technical Information Center directly from DTIC, Cameron Station, Alexandria, Va., 22314. Anyone may purchase documents from NTIS, Department of Commerce, Springfield, Va. 22161. The multidigit AD number given for each report is the accession number that should be used in requesting documents from DTIC or NTIS.

Research Reports, Technical Reports and Research Products may also be obtained on loan from depository libraries in many metropolitan and university centers. A list of these libraries is given at the end of this publication.

ABSTRACTS OF RESEARCH PUBLICATIONS

Research Reports

RR 1210. Montgomery, C. A., Thompson, J. R., & Katter, R. V. (Operating Systems, Inc.). Imagery Intelligence (IMINT) production model. January 1980. (AD A086 455)

The Imagery Intelligence (IMINT) production model was developed as a part of a study entitled "Investigation of Methodologies and Techniques for Intelligence Analysis," aimed at constructing a model of the cognitive processes underlying intelligence analysis. The approach to constructing such a model is based on the investigation of analytical processing in two types of single source analysis (SIGINT) and IMINT, subsequently generalizing to multisource analysis. For this investigation, intelligence analysis was defined as a spectrum of analytical judgmental activities involved in the processing and production of intelligence, in which particular individuals may devote more or less time to different aspects of such activities according to their roles in the intelligence cycle.

The IMINT production model was developed to serve as a basis for selecting IMINT processes involving high analytical and judgmental content for further study, directed at understanding the cognitive functions that underlie these IMINT processes. Thus, the model was constructed with a specialized focus for the purposes of the study described above. Rather than concentrating exclusively on either strategic or tactical IMINT, the model was designed to encompass both dimensions of IMINT. The rationale for this decision was that imagery interpretation analysts (IIAs) with more than minimum length of service are likely to operate in each type of mission at some time in their careers, demonstrating the practical assumption that the required knowledge base and cognitive skills are similar for the two dimensions of IMINT. The imagery interpretation analyst is the true generic focus of the IMINT production model presented in this report; to gather data for developing the model, 56 interviews with IIAs were carried out at eight sites, including both strategic and tactical missions.

The report contains three sections: an introduction, an overview of the IMINT production model, and the model description. Section 1 describes the IMINT model in the context of the study discussed above and also treats the scope of the model and the collection of the information on which the model is based. Section 2 presents an overview of the model, describing findings about the role of the imagery interpretation analyst, the impact of management on analysis, the IMINT time dimension, and the special role of informal information channels in IMINT analysis. This section also describes the format of the model description, which is represented in terms of hierarchical input-process-output (HIPO) charts. Section 3 presents the model, which is segmented into two major parts: IMINT production management activities and IMINT processing, analysis, and reporting activities.

RR 1228. Blum, R. W., Callahan, C., Graulich, M., Kinley, W., & Witus, G. (Vector Research, Inc.); & Geiselman, R. E., & Samet, M. G. (Perceptronics, Inc.). Information management for the Tactical Operations System (TOS). October 1979. (AD A082 974)

This executive summary presents synopses of three items resulting from the first phase of a project to establish guidelines for a Standing Operating Procedure (SOP) for managing information at the division level within the Tactical Operations System (TOS), an automated staff-operations information system. Two research products were developed, a provisional SOP and a TOS design/decision aid model. ARI Technical Report 385, the third item, presents the qualities found to be characteristic of a "good" summary of battlefield intelligence information.

RR 1230. Ryan-Jones, D. L. Development and evaluation of a simple job performance aid for M151A1, A2 truck operators. November 1979. (AD A082 817)

This report describes the development and evaluation of a prototype job performance aid for M151A1, A2 truck operators. The job performance aid was formatted as a checklist and was derived from a consolidation of operator checks describing the standards of maintenance on the vehicle for the operator and his supervisor.

The job performance aid was evaluated in comparison with the operator's technical manual (TM 9-2320-218-10, August 1978). Twenty soldiers were randomly assigned to the job performance aid condition or the technical manual condition, and to one of two vehicles. Each soldier inspected a vehicle using the performance aid or the technical manual, and performance was assessed in terms of the percentage of faults found by the soldier in relation to the actual number of faults on the vehicle. Using the job performance aid resulted in better performance than using the technical manual in terms of the percentage of faults found (29.8% vs. 10.2%).

RR 1232. Smutz, E. R. Soldier satisfaction with life in restructured units during phase 1 of the Restructuring of the Heavy Division test. September 1979. (AD A092 106)

A questionnaire was designed to gather information on lower ranking (E1-E4) enlisted men's attitudes toward working and living in their units during the Restructuring of the Heavy Division test at Fort Hood, Tex. The questionnaire was administered to unit personnel shortly after they began restructuring and again after the units had been restructured for about 4 months. The questionnaire was also administered to a control group of soldiers whose units were not restructured. Results of the study showed that immediately following restructuring there were few differences between soldiers in restructured units and soldiers in nonrestructured units in terms of their attitudes toward working and living in their units. However, after 4 months, soldiers in restructured units generally expressed more positive attitudes than did soldiers from nonrestructured units. Because the restructured units received publicity, attention, and additional support that was not given to nonrestructured units, however, these results may not necessarily apply to units that might be restructured in the future.

RR 1233. Granda, T. M. An application of human factors concepts to an interactive computerized personnel record-keeping system. January 1980.
(AD A083 160)

This report describes a "hands-on" demonstration that illustrates how human factors principles can be applied to the design of the human-computer interface and the operational procedures of an interactive, real-time Army personnel record-processing system. The Standard Installation/Division Personnel System (SIDPERS) was identified as a typical record-processing system suitable for conversion to an interactive computer system. Four SIDPERS transactions (duty status, departure, arrival, and grade change) were selected as representative tasks for demonstrating the application of behavioral principles. The demonstration was programmed on the PLATO (Programmed Logic for Automatic Teaching Operation) system.

The demonstration focused on the interactions between the computer and both an experienced and an inexperienced processing clerk. The demonstration also displayed interactions between a unit supervisor and the computer and between SIDPERS personnel and the computer. The demonstration capabilities included error detection and correction, definition of terms, variable input format, and efficient information retrieval.

The hands-on demonstration clearly showed the advantages of an interactive system designed for the user: reduction in processing time and number of errors per transaction, accommodation to users with different needs and levels of skill, and increased user satisfaction.

RR 1234. Osborn, W. C., Campbell, C. H., & Harris, J. H. (Human Resources Research Organization). The retention of tank crewmen skills. December 1979.
(AD A086 399)

This research was conducted to study the retention of armor crewmen skills from the time of training through the early months of job assignment. Performance tests of job tasks were administered to soldiers in two Armor MOS at the end of formal training and again after 4 to 8 months on the job. Proficiency overall remained unchanged from school to the field, but when examined by task category proficiency was found to decline for tasks common to all crewmen and to increase for tasks specific to a crew position. No systematic changes in proficiency occurred as a function of time since training or relevance of job assignment. Results were discussed in terms of task characteristics and procedural factors.

RR 1237. Montgomery, C. A., Thompson, J. R., & Katter, R. V. (Operating Systems, Inc.). Human processes in intelligence analysis: Phase I overview. December 1979. (AD A086 503)

This report provides an overview of the results of a study entitled "Investigation of Methodologies and Techniques for Intelligence Analysis." The goal of this study was to develop a framework for understanding human processes in intelligence analysis. An understanding of these processes will be useful during the development or evaluation of training procedures, doctrine, and system requirements for automated support to analysts.

The approach taken in this project was a parallel development of intelligence production models and a cognitive model of intelligence analysis. The Imagery Intelligence (IMINT) production mode' (ARI Research Report 1210) developed under this project and an existing Signals Intelligence (SIGINT) production model were used as the basis for developing a generic model of intelligence production, described in this overview. The generic production model includes a description of the hierarchical flow of intelligence data, tasking, etc., as well as a listing of critical variables influencing analysis. A detailed review of the psychological literature described in ARI Technical Report 445, combined with the production models, led to development of a descriptive model of cognitive processes described here. This overview also explores some of the implications of the cognitive model for training development, system development, and organizational control of intelligence production. The cognitive model will be extended, and these implications will be examined in greater detail, during Phase II of this project.

RR 1238. Fink, C. D., & Carswell, W. A. (Kinton, Inc.). Integrated personnel and training information for TRADOC System Managers (TSM): Technological gaps. February 1980. (AD A086 593)

The Integrated Personnel Support (IPS) model outlines the procedures that should be followed during the development of personnel and training subsystems for new materiel systems. This report identifies some of the technological problems that must be solved before benefits from the application of the IPS model can be achieved. These problems, or "technological gaps," were identified during an extensive literature review for, and the subsequent development of, a handbook for TRADOC System Managers (TSMs).

Most of the technological gaps related to deficiencies in procedures for estimating training and personnel requirements and for the development of training strategies during Phases I and II of the Army's Life Cycle System Management Model (LCSMM). Specifically, an absence of satisfactory techniques was found for (a) deducing training and personnel requirements from materiel characteristics; (b) identifying excessive human resources demands stemming from materiel concepts; (c) identifying functions most appropriately performed by equipment, by persons, or by a man-machine combination; (d) generating task analytic data during Phase I of the LCSMM; (e) identifying high-risk training tasks during Phase I of the LCSMM; (f) indicating appropriate training strategies before actual hardware is developed; and (g) describing human resources data/requirements/constraints in terms that are meaningful to design engineers.

RR 1239. McGuire, W. J., & Kress, G. (Human Resources Research Organization). Tank platoon training program outline for USAREUR units. February 1980. (AD A086 589)

This report presents a training program outline for preparing tank platoons to perform to standards in the Table IX Tank Platoon Battle Run. The program is designed for use at local training areas. It describes procedures for exercising all functional tasks of the Platoon Battle Run and offers suggestions for evaluating performance on the exercises.

Included are (a) a functional task analysis of the Platoon Battle Run; (b) a description of operational tasks in which the functional tasks are exercised; and (c) suggested training methods for the operational tasks, utilizing nonfire dry runs, subcaliber fire and scaled ranges, simulated fire and maneuver, and terrain boards/sand tables. The training program outline is designed specifically for use with the M60A1 tank system.

RR 1242. Phelps, R. H., Halpin, S. M., Johnson, E. M., & Moses, F. L. Implementation of subjective probability estimates in Army intelligence procedures: A critical review of research findings. March 1980. (AD A093 695)

This report examined the formulation and expression of uncertainty in both the tactical intelligence estimate of enemy threat and the evaluation of information contained in spot reports. A study was made of both the doctrinal procedures for expressing uncertainty (FM 30-5) and the research conducted to detect problems in implementing these procedures.

Findings showed that current procedures that focus on the use of terms such as "probable" and "unlikely" to express uncertainty are ambiguous communicators for both the user and the recipient. The use of numerical subjective probability estimates as an alternative procedure (e.g., ".70" instead of "likely") was explored by relating the psychological research on the use of subjective probability estimates with the need of Army intelligence analysts to unambiguously express uncertainty. It was concluded that there is sufficient evidence indicating the superiority of the numerical estimates to recommend a trial implementation of the use of numerical subjective probabilities. General guidelines are discussed for the incorporation of numerical estimates in the analysis and communication of Army intelligence.

Technical Paper

TP 385. Geiselman, R. E., & Samet, M. G. (Perceptronics, Inc.). Information summarization in a corps-level scenario. October 1979. (AD A078 021)

This research obtained data to develop guidelines for summarizing Tactical Operations System (TOS) message content, particularly tactical intelligence data. Sixteen staff officers were asked to read a description of a tactical scenario and to examine 30 enemy situation data (ESD) messages describing the beginning of an enemy border crossing and attack. Each officer's task was to summarize the tactical information contained in the messages in preparation for a 3-minute briefing of the G2. The 16 handwritten summaries were typed and evaluated by five military raters.

Collectively, the raters felt that a "good" summary of intelligence information should give hard facts in conversational style and an interpretation of the intelligence information. In terms of a general outline for summarization (i.e., the schema), summaries judged "good" by the raters tended to first describe the engagement of enemy forces along the border, then unit movement both near and behind the border. Following this summary, the locations of key support units were noted, often in conjunction with a statement concerning the location of the second echelon. Finally, another inference was made regarding the probable point of main thrust by the enemy. It was suggested that these

prescriptive norms can be translated into guidelines for staff officers to enable them to produce more useful and effective intelligence-message summaries.

Technical Reports

TR 391. Eaton, N. K., Bessemer, D. W., & Kristiansen, D. M. Tank crew position assignment. October 1979. (AD A077 841)

This research was conducted to determine whether available paper-and-pencil aptitude and training measures could be used to predict tank driver, gunner, and tank commander performance, and if so, to develop appropriate prediction equations based on the aptitude measures.

The research had three phases. The first two phases were conducted with armor trainees at Fort Knox and dealt with the gunner and driver positions. The third phase was conducted with armor crewmen in operational armor battalions and dealt with the tank commander and gunner positions. In Phases I and II, measures of trainee aptitudes, training performance, driving performance, and main-gun tank gunnery were collected for trainees in the sample. During Phase III, aptitude and main-gun firing measures were collected for tank commanders and gunners in a sample from a USAREUR armor division.

With armor trainees at Fort Knox, a number of potentially useful predictor variables were identified in Phase I. These included four ASVAB tests and three additional paper-and-pencil tests as gunnery predictors and six ASVAB tests and two additional paper-and-pencil tests as driving predictors. Only one of the driving predictor tests was validated in Phase II, and none of the paper-and-pencil tests was correlated with the gunnery measure. Nevertheless, certain methodological problems entered Phase II, so the failure to validate the other tests did not necessarily indicate a true lack of relationship with criterion performance. In Phase III, conducted with operational units, none of the tank commanders' or gunners' paper-and-pencil test scores was correlated with tank crew qualification gunnery scores.

The results from Phases I and II suggest that the continuing need to make optimal assignments of Army recruits to gunner/loader or driver training may best be addressed by continued research on the paper-and-pencil measures identified in Phase I, as well as the exploration of other techniques such as job sample performance measurement. In continued research with the paper-and-pencil tests, formulas based on both regression-based models and unit-weighted models seem appropriate. The results from Phase III indicate that paper-and-pencil tests do not seem to offer promise of predicting performance of personnel in operational units on tank crew qualification gunnery. Perhaps research efforts could best be directed toward the development and empirical validation of job sample and simulator techniques based on sound task analyses. Such job sample/simulator research might also lead to measures to supplement prediction of gunnery performance for armor trainees.

TR 405. Ozkaptan, H. Evaluation of the utility of the theory of signal detection for target acquisition studies. October 1979. (AD A082 931)

This study explored the effects of instruction and target-to-background contrast, within the framework of signal detection theory, on the performance

of Army aviators during a target acquisition task. Its goal was to determine whether the typical measures of target acquisition performance (reaction time and frequency of hits) would be influenced by the type of experimental instructions given to the test participants, and whether the signal detection parameters of bias and sensitivity would reflect instructional and target-to-background contrast differences, respectively. In addition, a critical goal was to determine whether the signal detection measures could be used, by means of an analysis of covariance, to remove the bias effects of instructional differences from the reaction time and frequency of hit data.

A target acquisition task during a simulated helicopter pop-up maneuver at 1,000 feet altitude was presented, with a 30-second exposure time. The observer's task was to search for a single 20-foot military tank in various field locations, and at a slant range of 2,500 feet. The scenes were presented with and without targets, in order to obtain an observer's hit rate and false alarm rate, the basic procedural requirement for signal detection theory. Three levels of instruction and two levels of target-to-background contrast were employed. Twelve Army helicopter pilots were assigned to each instructional level, with target-to-background contrast as a within factor. The design was presented in the form of a 4 x 4 Latin Square to assure experimental control of the effects of trial sequence, target background, and the order of presentation of target-to-background contrast.

The experimental differences in instruction and target-to-background contrast had a statistically significant effect on the reaction time and frequency of hit data, and were reasonably represented by the signal detection measures. The latter can be successfully used to adjust the frequency of hits between target acquisition studies and to remove the effects of different instructional sets as well as different target-to-background contrast levels. The signal detection parameter for sensitivity represents the primary covariate for the adjustment of hits due to its primary statistical dependence on the frequency of hits, with the parameter for bias playing a lesser role. The signal detection parameters, however, do not adjust for the differences in reaction time. This is due to the dependence of the signal detection model on frequency of hits and false alarms, and the lack of correlation of these measures with reaction time. Within certain procedural constraints, the signal detection model possesses utility for applied target acquisition studies.

TR 410. Hagman, J. D., & Schendel, J. D. *Effects of refresher training on job-task typewriting performance.* October 1979. (AD A076 132)

Two groups of 15 administrative specialists, 71L Military Occupational Specialty (MOS), participated in four job-task refresher training sessions designed to enhance the typewriting of military correspondence. One group performed under a study training method that allowed use of a correspondence manual while arranging materials into the correct format. The other group performed under a recall training method that required reliance on memory rather than the correspondence manual for format information. Under both methods, soldiers received knowledge of results concerning both typewriting speed and accuracy. Straight-copy typewriting performance also was measured at each training session.

Both training methods produced approximately a 36% increase in format arrangement speed without an associated increase in error. These benefits occurred regardless of a soldier's time in MOS or on-the-job typewriting experience. Straight-copy typewriting performance remained at an average level of 23 net words per minute across sessions and did not reflect job-task typewriting proficiency.

Timely and consistent use of knowledge of results was suggested to be the reason for the typewriting improvements obtained under both training methods. Similar use of knowledge of results in an on-the-job environment also should improve job-task typewriting performance and thereby reduce the need for a formal refresher training program.

TR 413. Leahy, W. R., Siegel, A. I., & Wolf, J. J. (Applied Psychological Services, Inc.). A digital simulation model of message handling in the Tactical Operations System: IV. Model integration with CASE and SAMTOS. October 1979. (AD A086 450)

The human-performance-oriented computer simulation, called MANMOD, of the U.S. Army's Tactical Operations System (TOS) was modified and extended to allow increased capability and generality. The modifications and extensions included but were not limited to (a) incorporation of the capability to simulate error message receipt and processing; (b) interaction and integration with a modified CASE model and with the SAMTOS model, which principally simulate TOS equipment functions; and (c) implementation of the MANMOD on the Univac 1108 computer system.

The modified MANMOD was tested relative to sensitivity and reasonableness of output. The evidence supports the use of the model for a number of functions relative to system design, training requirements and objectives derivation, personnel requirements, and tradeoffs.

TR 414. Leahy, W. R., Siegel, A. I., & Wolf, J. J. (Applied Psychological Services, Inc.). A digital simulation model of message handling in the Tactical Operations System: V. User's guide to the integrated MANMOD/CASE/SAMTOS computer simulation. October 1979. (AD A086 355)

This document is a complete guide for the use and interpretation of the computer simulation program--MANMOD. The program is stored in files on the Univac 1108 computer at the Edgewood Arsenal. The MANMOD program calls the Army Research Institute's MANMOD simulation of the Tactical Operations System and provides an interface with the CASE and the SAMTOS computer simulation models.

The MANMOD program is written in FORTRAN IV. Sufficient information is provided in this manual to allow simulations to be performed by individuals with a minimum of computer-related experience. In addition, detailed flow charts and variable lists are provided for the use of skilled programmers who desire a more technical description of the mechanics of the simulation and to allow program changes to be made more easily.

TR 416. Swezey, R. W., Pearlstein, R. B., & Ton, W. (Applied Science Associates, Inc.); & Mirabella, A. (ARI). Contemporary views on criterion-referenced testing. October 1979. (AD A082 751)

This review of the technical and theoretical literature in the area of criterion-referenced testing (CRT) considers a number of areas in CRT development and application. The report discusses questions of CRT reliability and validity in both practical and theoretical areas. Different methods of CRT construction are reviewed, as is the question of simulation fidelity (e.g., the estimate to which CRTs can and should mirror real-world performance conditions). Discussion is directed to the use of CRTs in mastery learning contexts and to test materials development and item sampling. Diagnostic uses of CRTs and the establishment of cut-off scores are considered. Uses of CRTs in public education and in a military context are reviewed. Finally, a position is set forth on general and theoretical aspects of CRT construction and use.

TR 417. Epstein, K. I. Statistical models for criterion-referenced testing and decision making. October 1979. (AD A080 651)

This study investigated the characteristics of a well-constructed criterion-referenced performance test and compared several statistical models that might help interpret criterion-referenced test scores. The models were compared on the accuracy of the pass or fail decisions that they implied and the accuracy of their estimates of examinee true scores. The data base consisted of scores achieved by U.S. Army military police trainees on the Military Police Firearms Qualification Course, a criterion-referenced performance test designed to assess .45 caliber pistol marksmanship skills. Trainees fired 240 rounds each to define their pass or fail classification and their true ability. Subtests of 10, 20, 40, 80, and 120 rounds were also sampled.

The comparison of the statistical models indicated relatively few differences between the models and no evidence that one was better or worse than others. The comparison data did, however, clearly demonstrate the importance of a close match between test items and the domain to which results are to be generalized. When test items did not match the skill domain, the risk of incorrect classification decisions was high, the magnitude of the decision errors was not accurately predicted by statistical considerations, and the true abilities of examinees were poorly estimated by all models. When the items more closely approximated the domain, the amount of classification error decreased and became more predictable, and true abilities were more accurately estimated.

TR 418. Ryan-Jones, D. L. A comparison of expert ratings of task difficulty with an independent criterion. November 1979. (AD A082 016)

This report evaluates the possibility of using "expert" ratings of task difficulty as a substitute for actual measurement or determination of task difficulty. Task difficulty information exists for only a small number of tasks in the U.S. Army inventory of tasks. Accurate ratings of task difficulty would reduce the logistical problem of actually measuring difficulty for each task in the inventory.

Expert ratings of task difficulty were compared with the results of a criterion-referenced test of the same tasks. There was a nonsignificant correlation between the expert ratings and the independent measure of difficulty. Further research is needed on methods of improving expert ratings of task difficulty.

TR 422. Tzeng, O. C. S., & Landis, D. (Indiana University-Purdue University at Indianapolis). Relationship between intercultural awareness and personality variables in interracial encounters. October 1979. (AD A082 890)

This study investigated the relationships between an individual's personality characteristics and his or her understanding of the dynamics involved in potential interracial conflicts and controversies in the Army. Data collected from 78 Army personnel, with about equal proportions of both blacks and whites, and of both officers and enlisted men, included ratings on four measures: (a) a set of predeveloped intercultural awareness (IA) questions, (b) the Machiavellianism scale, (c) the Least Preferred Coworker (LPC) scale, and (d) the group atmosphere scale.

Within-measure analyses of the last three scales revealed interesting results of interracial and/or interracial differences in attribution of various personality traits inherent in the measures. Between-measure analyses in using the IA Scale as a dependent variable yielded two important principles in interracial relations: (a) intercultural awareness is directly related to an individual's personality and cognitive style characteristics; and (b) elevation of an individual's cultural awareness level will definitely improve one's attitudes, values, and behavioral dispositions toward the members of another culture and thus decrease the intercultural gaps and/or conflicts in interracial encounters. Finally, the paper examines an important theoretical framework along with five determinants that should be considered for an effective intercultural training program in the future.

TR 424. Abstracts of ARI research publications, FY 1974 and 1975. October 1979. (AD A082 704)

Abstracts and bibliographic citations, including DDC accession number, are given for 29 Research Reports, Technical Research Notes, and Technical Papers published by the Army Research Institute (ARI) during fiscal years 1974 and 1975. The technical areas and field units in which the research was done are described briefly. To complete the record of research, abstracts of 32 intra-agency Research Problem Reviews and Research Memorandums are included. Indexes by author and by research area and a list of Federal depository libraries where the published reports may be obtained are given.

TR 425. Abstracts of ARI research publications, FY 1976. November 1979. (AD A082 772)

Abstracts and bibliographic citations, including the DDC accession number, are given for 30 Research Reports, Technical Papers, Utilization Reports, and Technical Reports published by the Army Research Institute (ARI) during fiscal year 1976. To complete the record of research, abstracts or descriptions

are included of 8 research products (e.g., Guidebook for Developing Criterion-Referenced Tests) and of 40 intra-agency Research Problem Reviews, Research Memorandums, and Technical Reports. All items are indexed by author and corporate author and by research area. The Federal depository libraries where the published reports may be obtained are also listed.

TR 427. Kottas, B. L., & Bessemer, D. W. Evaluation of a gunnery simulator's visual display and several strategies for leading moving targets. October 1979. (AD A086 459)

The presence of high-speed armor targets on the modern battlefield necessitates training gunners to judge target speeds in order to apply appropriate leads. The current research investigated trainees' speed judgments of a moving target and spatial estimates of a gunnery simulator's visual display.

Distance, range, and slant estimates in the simulator revealed systematic underestimation of distance and range, overestimation of slant, and large interobserver variability, a pattern of results typical of research on space perception. Application of speed judgment data to a model of tank gunnery indicated that asking gunners to classify target speed as fast, medium, or slow and to apply one of three corresponding leads should prove an effective lead strategy. Application of the data to the gunnery model demonstrates that selection of a cognitive strategy for training may affect operational performance. The current research will be of value to instructional system developers, because it demonstrates the importance of unobservable processes, such as cognitive strategies, for training.

TR 428. Farrell, J. P., & Potash, L. M. Comparison of alternate formats for the portrayal of terrain relief on military maps. November 1979. (AD A081 739)

Two experiments evaluated the effectiveness of relief shading and layer tints as supplements to contour lines for solving eight types of military map-use problems. The addition of layer tints was found to increase the speed of solving most problems with no loss in accuracy. The addition of shaded relief increased the time required to solve problems requiring detailed information but may be valuable in providing a quick general impression. Personnel experienced in using military maps solved map problems more accurately but no faster, on the whole. Also, solving military map-use problems in the classroom appears to correlate with performance in the field.

TR 429. Goehring, D. J. Reliability of a measure of institutional discrimination against minorities. December 1979. (AD A082 826)

The technical properties of a statistical measure of the construct of institutional discrimination are discussed. Two methods of dealing with the problem of reliability of the measure in small samples are presented. The first is based upon classical statistical theory, and the second derives from a series of computer-generated Monte Carlo analyses. A test for differences between the measures is also developed and presented.

TR 430. Singer, R. N., Ridsdale, S., & Koriene, G. G. (Florida State University). Achievement in a serial positioning task and the role of learner strategies. December 1979. (AD A082 749)

Forty college students were randomly assigned to one of four conditions in order to ascertain the effectiveness of various learner strategies upon the learning, retention, and transfer of a computer-managed serial motor task. The four conditions were imagery, chunking, rhythm, and control. The subject's task was to move a joystick, which in turn moved a cursor on a monitor, to each of 10 predetermined positions and correct sequence.

In general, the typical serial recall curve and the expected primacy-recency effect was not found, perhaps due to the number of responses required on each trial. Imagery and chunking strategies provided more accurate and consistent performance across all 10 positions in the acquisition and transfer tasks. No differences in performance in retention were noted among the groups, although the subjects reproduced positions more accurately after the unfilled retention interval as compared with the filled interval.

TR 431. Hagman, J. D. Effects of presentation- and test-trial training on motor acquisition and retention. January 1980. (AD A086 406)

The experiment examined the relative effects of three training methods on the acquisition and retention of a positioning motor task. Three independent groups of subjects (15 per group) performed three training trial cycles consisting of six trials each. Training methods differed in their emphasis on presentation (p) and test (t) trials during each cycle. For one group, a cycle consisted of three p- and t-trials administered in alternation. For another group, the first five trials of each cycle were p-trials and the sixth was a t-trial. For the last group, the first trial was a p-trial and the next five were t-trials. Group acquisition performance was compared at the last trial of each cycle, while retention was compared at 3 minutes and at 24 hours after acquisition.

Absolute error scores indicated that acquisition and short-term retention were best when training emphasized p- and t-trial alternation and p-trial repetition within cycles, whereas long-term retention was best when training stressed t-trial repetition. Results suggest that testing is an effective way to enhance long-term retention of motor skill. This enhancement could be realized by changing the emphasis of training from presentation to testing without added expenditures in training time, money, and personnel. If, instead of long-term retention, the goal is rapid acquisition and short-term retention, training methods that emphasize either alternation of presentation and testing or repeated presentation would be most effective.

TR 434. Rouse, W. B., Rouse, S. H., Hunt, R. M., Johnson, W. B., & Pelligrino, S. J. (University of Illinois). Human decision-making in computer aided fault diagnosis. January 1980. (AD A086 457)

This report summarizes six experiments conducted to increase understanding of human performance on diagnostic tasks, and in the process to investigate the feasibility of using context-free, computer-based simulations to train

troubleshooting skills. Three simulated diagnostic tasks were developed: a simple context-free task, a complex context-free task, and a context-specific task (simulation of aircraft powerplants). The six experiments evaluated the effects of computer aiding on performance of each task and on subsequent unaided performance, using different task mixes, subjects (4 to 48 engineering or technical trainees), and conditions (self-pacing vs. forced pacing, feedback loops).

Computer aiding reduced the number of tests required to diagnose simple problems and enhanced subsequent unaided performance except when subjects were under time pressures. Training on the simple task with computer aiding first inhibited and then enhanced performance on the complex context-free task. Training on the context-free tasks improved performance on the context-specific task. Results provide a data base for both theoretical issues in fault diagnosis and practical application of computer aiding to live system performance.

TR 435. Johnson, W. B., Rouse, S. H., & Rouse, W. B. (University of Illinois). An annotated selective bibliography on human performance in fault diagnosis tasks. January 1980. (AD A086 592)

This is an annotated bibliography of 61 published works about human performance in fault diagnosis. The sources are predominantly from the disciplines of engineering, psychology, and education. Computer searches were conducted of the past 10 years of Psychological Abstracts and ERIC documents. Manual searches using references from reports, University of Illinois library card catalog, and solicitation of references from experts in the field extended the search to include references dating from the early 1950s.

TR 436. Griffith, D. A review of the literature on memory enhancement: The potential and relevance of mnemotechnics for military training. December 1979. (AD A086 407)

This report reviews the literature on memory enhancement and assesses the potential of techniques designed to enhance memory (mnemotechnics) for military training. An overview describes a wide range of mnemotechnics. After a review of the empirical literature on mnemotechnics, a research strategy is offered for applying mnemonics and mnemotechnics to military training. Mnemonics and mnemotechnics have the potential to significantly enhance training effectiveness. However, if they are not carefully researched and implemented, it is likely that their training potential will be mitigated, if not entirely lost.

This report is intended primarily for professional researchers to identify areas of needed research. It can also be used by the military training community to assess the training potential of mnemonics and mnemotechnics.

TR 437. Kern, R. P. Usefulness of readability formulas for achieving Army readability objectives: Research and state-of-the-art applied to the Army's problem. January 1980. (AD A086 408)

This report was prepared to help the Army evaluate the usefulness of readability formulas in identifying material that can be comprehended by readers at a given reading skill level.

Existing readability methods and research findings were reviewed against three major criterion questions. These questions and conclusions reached for each are as follows: (a) How effectively do formulas predict comprehension at targeted reading grade levels? Formulas cannot match material to reader; (b) Does rewriting to lower readability scores increase comprehension? No; (c) How will formula score requirements affect production of written materials? Requiring that text be written to satisfy a targeted reading grade level score focuses attention on meeting the score requirement rather than on organizing the material to meet the readers' information needs.

An approach is outlined for developing a broader-based method and criteria to bypass the serious deficiencies of current readability formulas.

TR 439. Griffith, D. The keyword method of vocabulary acquisition: An experimental evaluation. January 1980. (AD A086 880)

An experiment assessed the effectiveness of a mnemotechnic (memory technique), the keyword technique, for learning foreign language vocabulary. Participants were 60 Army enlisted personnel, 20 from each of the following ranges of general technical (GT) aptitude: 90 and below, 91 to 109, and 110 and above. All personnel learned the English translations of 15 Korean vocabulary terms at a self-paced rate. Half the personnel in each group were instructed in the keyword technique and were supplied keywords for each vocabulary item, while the remaining personnel served as a control group. According to the most representative criterion, the keyword group performed 79% better than the control group. Although of primary interest to other researchers, this report should also be of direct interest to the Defense Language Institute and the training community.

TR 440. Henriksen, K. F., Jones, D. R., Jr., Hannaman, D. L., Wylie, P. B., & Shriver, E. L. (Kinton, Inc.); & Hamill, B. W., & Sulzen, R. H. (ARI). Identification of combat unit leader skills and leader-group interaction processes. January 1980. (AD A084 977)

The purpose of this research was to identify analytically those leader skills and leader-group interactive processes having potential influence on unit performance in tactical situations. A historical review of the leader research literature was conducted, with special focus on leader skills and processes as they occur in tactical settings.

On the basis of historical engagement simulation (ES) data (battle narratives, audio tapes, and net control sheets collected at ES exercises), the literature research, and research staff ES/combat experience, a listing of leader skill categories and individual leader skills was developed. The skill

categories were arrived at inductively by listening to audio tapes and examining battle narratives, listing the individual skills involved, and arriving at a general skill category under which the numerous individual skills could be subsumed. If there were a parallel skill category already existing in the research literature (e.g., initiating structure) that consisted of the same skills involved in ES, it was readily adopted. Many of the skill categories, however, did not have identical counterparts in the research literature. The skill categories, subsumed under five broad headings, were (a) management skills--planning, execution and control, initiating structure, and interacting with subordinates and superiors; (b) communication skills--transfer of information and pursuit and receipt of information; (c) problem-solving skills--identification and interpretation of cues, weighing alternatives, and choosing a course of action; (d) tactical skills--application; and (e) technical skills--equipment and basic.

TR 442. Hyman, A., Johnson, R. M., & Gade, P. A. Helicopter electro-optical system display requirements: II. Performance of helicopter pilots when using a low-light-level television system during simulated night nap-of-the-earth flight. March 1980. (AD A086 855)

Previous ARI research has shown that pilots believe they can successfully use a low-light-level television system as an aid in night nap-of-the-earth (NOE) flight, even when the highlight luminance of its display is as little as 0.06 footlambert (fL). Videotaped presentations were used in this prior research, and estimations of the lowest usable display luminance were established on the basis of pilot judgment.

The present experiment was designed to provide more objective evidence for determining the utility of such low-luminance displays when they are used as aids in night NOE flight. Each of 24 Army helicopter pilots made 24 simulated flights over a highly realistic three-dimensional terrain model as generated from an optical probe used in conjunction with an SIT television camera. The results showed that pilots had fewer crashes when using a larger display. All pilots flew as well with displays set so that highlight luminance was about 0.05 fL as they did with displays set so that highlight luminance was about 0.2 fL. This report discusses the implications of these results for designing a usable low-light-level television system for night NOE flight.

TR 444. Singer, R. N., & Anshel, M. H. (Florida State University). The modular approach (with strategies) to learning motor skills. March 1980. (AD A089 793)

Instructors and researchers increasingly view the individual as an active participant in the process of learning. That is, rather than responding passively to environmental cues, learners can influence the way knowledge and skills are acquired. Thus, learning should be facilitated if a learner develops appropriate cognitive strategies or particular mental operations. Literature on verbal and psychomotor learning supports this contention. Further, appropriate individualized instruction may provide more efficient learning than conventional group instruction. Self-contained (modular) instructional packages could be designed to teach not only a desired skill but a variety of

learning strategies that would aid in acquiring the desired skill and would generalize to aid in acquiring other skills.

A set of modules was developed for self-instruction in the complex gross motor skill of juggling; a sample module is presented. Related research has indicated that the group of high school students who were given this modular instruction with learning strategies performed markedly better than students who received conventional classroom instruction without learning strategies.

TR 445. Montgomery, C. A., Thompson, J. R., & Katter, R. V. (Operating Systems, Inc.). Cognitive processes in intelligence analysis: A descriptive model and review of the literature. December 1979. (AD A086 451)

The descriptive model of cognitive processes in intelligence analysis presented in this report was developed as a part of a study entitled "Investigation of Methodologies and Techniques for Intelligence Analysis." The approach to constructing the model is based on the investigation of analytical processing in two types of single-source analysis (SIGINT and IMINT), subsequently generalizing to multisource analysis. For the purposes of this investigation, intelligence analysis was defined as a spectrum of analytical and judgmental activities involved in the processing and production of intelligence, where particular individuals may devote more or less time to different aspects of such activities according to their individual roles in the intelligence cycle.

A production model of imagery intelligence (IMINT) was developed to serve as a basis for selecting IMINT processes involving high analytical and judgmental content for further study, directed at understanding the cognitive functions that underlie these IMINT processes. The IMINT model is presented in ARI Research Report 1210. A general overview of the project is published as ARI Research Report 1237.

The present paper contains a detailed review of selected aspects of current psychological literature, as well as the cognitive model which is based on that literature and on investigation of the IMINT and SIGINT production models. The cognitive model and the literature review focus on how information is processed, stored, and retrieved from memory and evaluated and integrated to form intelligence. The model has general applicability to the full spectrum of intelligence-processing activities.

TR 446. Myers, D. C., Gebhardt, D. L., & Fleishman, E. A. (Advanced Research Resources Organization). Development of physical performance standards for Army jobs: The job analysis methodology. May 1980. (AD A091 767)

A scaled rating procedure for identifying the physical ability requirements of Army jobs was developed and used to collect data for a sample of incumbent soldiers drawn from four Military Occupational Specialties (MOS). The findings indicated that the instruments and procedures designed to obtain perceived physical ability requirements were reliable. The effort produced profiles outlining the physical ability requirements of each MOS given in this report.

A criterion task manual containing the more physically demanding tasks for each strength and stamina factor and a procedures manual describing the steps

necessary to establish physical ability requirements for additional MOS are published separately as ARI Research Products 80-5a and 80-5b. If the procedure proves valid, the Army can begin to use the methodology to establish physical ability requirements for all MOS on a judgmental rather than an empirical basis.

Research Notes

RN 79-20. Yoder, J. D., & Rice, R. W. (State University of New York at Buffalo); & Adams, J., Priest, R. F., & Prince, H. T., II (U.S. Military Academy). Reliability of the Attitudes toward Women Scale (AWS) and the Personal Attributes Questionnaire (PAQ). December 1979. (AD A076 165)

The stability and internal consistency of Spence and Helmreich's sex-role scales, the Attitudes toward Women Scale (AWS) and the Personal Attributes Questionnaire (PAQ), are reported. An entire first-year class of 1,007 male and 78 female cadets at the U.S. Military Academy were given a battery of psychological tests before and after cadet basic training, a 2½-month period. The AWS and PAQ proved to be highly reliable, comparable to other frequently used psychological tests. This psychometric information encourages researchers to make further use of these sex-role scales.

RN 79-21. Bonner, B. E., & Miller, E. E. (General Research Corporation). Analysis of mandatory training requirements for USAREUR battalions. April 1979. (AD A077 687)

An analysis of mandatory training requirements in terms of source, type of requirement, and impact was conducted for the U.S. Army, Europe (USAREUR) as part of an overall effort to improve the training management structure. This analysis was based on reviews of major and subordinate command regulations (350-1 regulation series) as well as other formal and informal sources of requirements. In addition, survey data were obtained that related to the perceived importance of specific mandated requirements by commanders.

The findings indicated a profusion of uncoordinated requirements with great variability in specificity and impact as well as perceived importance. Recommendations are made for revising the nature of mandatory training requirements, reducing their numbers, and controlling future proliferation.

RN 79-22. Hayes, J. F. (ARI); & Wallis, M. R. (American Institutes for Research). Initial ARTEP validation results: 1974-75. November 1979. (AD A077 177)

This report presents the results of an ARI survey conducted in conjunction with the TRADOC Combat Arms Training Board initial validation of the Army Training and Evaluation Program (ARTEP) in 1974-75. The tests were conducted with units of the 9th Infantry Division and 1st Cavalry Division using test editions of ARTEPs 7-45 and 17-35. The data sources used in the survey included records of interactions between TRADOC and participating personnel, published test directives, observation of the exercises, interviews and/or questionnaires administered to all participants, and review of unit After

Action reports. Based on the above, recommendations were made for revisions to the ARTEPs.

RN 79-23. Segal, D. R., Lynch, B. A., & Blair, J. D. (University of Maryland). The changing American soldier: Work-related attitudes of U.S. Army personnel in World War II and in the 1970s. December 1979. (AD A079 763)

This analysis compared work-related attitudes of a sample of soldiers in the all-volunteer Army in 1973 with the attitudes of soldiers in the conscription-based Army in 1943. Representative samples of enlisted men in 1943 were more positively oriented toward their jobs than were enlisted men in 1973. The relatively negative attitudes of soldiers in 1973 may reflect, at least in part, a postwar demoralization that was also observed after the end of World War II.

RN 79-24. Blair, J. D., Thompson, R. C., & Segal, D. R. (University of Maryland). Race and job satisfaction in the U.S. Army. December 1979. (AD A077 852)

The nature of racial differences or similarities in job satisfaction within a military context is an enduring research and policy issue. Studies of the American soldier during World War II found patterns of service-related attitudes among black soldiers that anticipated contemporary concerns. Black soldiers, on the average, expressed a greater sense of pride in their units, a greater sense of importance of their Army jobs, and more interest in their Army jobs than did white soldiers. Black soldiers were also more likely than whites to feel that their Army training would help them get better civilian jobs. However, in terms of their physical condition and general well-being, black soldiers during World War II gave more negative responses than did white soldiers. Regarding all of these variables as indicators of job satisfaction, Stouffer and his colleagues concluded that "There is no evidence that Negroes' general level of job satisfaction was higher than that of whites.... No conclusion can safely be drawn as to the comparative general level of job satisfaction, although there would seem to be little doubt that the Negro was somewhat more prone to regard his job as important and interesting."

RN 79-25. Kramer, R. C. (U.S. Military Academy); & Segal, D. R. (University of Maryland). Job satisfaction in the U.S. Army: 1943 and 1973. December 1979. (AD A077 853)

This paper is concerned with two related questions: whether junior enlisted men's perceptions of the nature of their service has changed with the end of conscription and the advent of the all-volunteer force; and the level of satisfaction of junior personnel in the all-volunteer force with the nature of their service relative to that of their conscription-era counterparts.

The first of these issues is based upon Moskos' (1977) hypothesis that military service has been transformed from a calling, legitimized in terms of institutionalized values, to an occupation, legitimized in terms of the market place. If Moskos is correct, then the notion of job satisfaction is relevant to the study of modern military service, which is seen as increasingly similar

to civilian employment, but is less relevant to the study of the conscription-era soldier, whose service was seen as different from civilian employment. However, it is notable that Stouffer and his colleagues (1949), in their research on the conscription-based Army of World War II, did regard satisfaction as an important attitude dimension, and research on noncombat troops in World War II has suggested that we perhaps have a romanticized notion of the nature of military service in that conflict (e.g., Rundell, 1978) based on the media image of the combat infantryman.

The second issue assumes that Moskos is correct, at least in his analysis of the all-volunteer force, and that if the Army is to be sustained without a military draft, job satisfaction will be one of the dimensions explaining the Army's success (or failure) in the accession and retention of high-quality personnel.

RN 79-26. Segal, D. R., Blair, J. D., Lengermann, J., & Thompson, R. C. (University of Maryland). Institutional and occupational values in the U.S. military. December 1979. (AD A077 854)

The U.S. armed forces have undergone three major interrelated changes during the past four decades. First, along with other industrial nations of the western world, they have abandoned the "mass force" model of rapid mobilization in times of war and demobilization in postwar periods in favor of a large standing force-in-being. Second, they have replaced a manpower system based on military conscription with an all-volunteer force, again reflecting general patterns in the industrial nations of Europe and the Anglo-American world. Third, the primary function of the military, particularly in industrialized nations with multiparty parliamentary governments, has been redefined, so that its mission is not to wage war but to contribute to stability in the international system through deterrence or constabulary operations.

Four themes have achieved prominence in sociological analyses aimed at describing and explaining the structural changes in military organization engendered by these changing definitions of the military institution: (a) the decline of the citizen-soldier; (b) convergence between civilian and military institutions; (c) the industrialization of the military organization; and (d) structural pluralism within the military. This analysis attempts to specify linkages among these theoretical constructs and to relate them to survey data on the attitudes of American military personnel in the 1970s.

RN 79-27. Dowdell, F. E. (U.S. Air Force). Gender differences in orientations toward military service. December 1979. (AD A077 855)

The United States has a history of calling on women for military service when faced with manpower shortages due to recruitment difficulties, demographic changes, or wartime mobilization. The role of women in the military is presently being redefined by policy makers, who are responding to demographic changes and more general social changes concerning the opening of traditionally masculine occupational specialties to women. Consequently, the military is attracting and enlisting women in record proportions during a nonwar period. The military has always been combat-oriented, and its promotion system favors combat experience, thus operating to the disadvantage of women, who have been

excluded from combat. The military has historically been a male domain. Thus, men, and not women, have been socialized to fill traditional (i.e., combat-oriented) military roles. Men have historically entered military service ready to give their lives for their country. Women, lacking this role definition, may enter military service with work-related attitudes that are discrepant from our traditional image of the military. This may place them at a disadvantage within the military. Even given this disadvantage, the military may be seen by women as a fairer employer than civilian employers.

RN 79-28. Segal, D. R. (University of Maryland). Models of contemporary American civil-military relations. December 1979. (AD A077 856)

The major issues raised in modern theories of civil-military relations are rooted in Harold D. Lasswell's developmental construct of "the garrison state." In a world in which modern military technology makes civilians as vulnerable to armed attack as military personnel, Lasswell projected that "specialists in violence," i.e., military elites, would add management to their repertoire of skills and would become a major force in ruling elites. Among their skills, they would count the manipulation of symbols, in the interest of mobilizing the entire population for defense efforts. Income would be somewhat equalized, in order to reduce opposition to the regime by the underprivileged. Economic production would be regularized and geared primarily toward military rather than consumption goods. Democratic elections would be replaced by plebiscite. What was new in Lasswell's thinking was not that military forces would play a major role in the governance of a state. Indeed, there is a large literature on the role of the military in politics. This literature, however, focuses on preindustrial nations. Lasswell believed that, as part of the normal course of development, military elites might gain ascendancy in modern industrial states.

RN 79-29. Blair, J. D. (University of Maryland). Internal and external integration at the nonelite civil-military interface. December 1979. (AD A077 857)

The nature of civilian-military linkages and their implications for civilian control of the military is an enduring research and policy issue. The advent of the all-volunteer force has resulted in a generally renewed focus on this issue, as reflected in a recent paper by Segal, Senter, and Segal. Their study addressed the question of how well the military is woven into the fabric of society. They focused on the structural linkages between a cross-section of the civilian population and the military institution and examined the implications of such linkages for civilian control of the military.

This paper examines the general issue of the integration of the military into society but extends existing analyses by also looking at the structural linkages between a representative sample of Army personnel and civilian society. In addition, the implications of these linkages for the internal integration of soldiers into the military organization as well as for their external integration into American society are examined. In the ongoing policy debate over the transition to an all-volunteer force, one major concern is whether voluntary conditions will lead to an increasingly isolated

military. It has been hypothesized that the military's boundaries are becoming less and less permeable, resulting in less civil-military contact and, consequently, less impact from civilian norms and sensibilities. Career military men have, for example, been found to hold ideological views that are increasingly distinct from their civilian counterparts.

RN 79-30. Borman, W. C., Johnson, P. D., Motowidlo, S. J., & Dunnette, M. D. (Personnel Decisions, Inc.). Measuring motivation, morale, and job satisfaction in Army careers. May 1975. (AD A078 444)

This report describes an extensive investigation of the constructs of motivation, morale, and job satisfaction as they relate to enlisted personnel in the U.S. Army. A comprehensive literature review helped to delineate definitions of the three constructs and to identify motivation and satisfaction inventories to be tried in the field. In addition to existing inventories, new measures also were developed for field testing, since the literature review revealed almost no measures explicitly designed to measure morale.

Another phase of the research was devoted to a series of workshops in which Army officers and enlisted personnel recounted actual episodes that they perceived to be indicative of different levels of unit morale. These episodes were used to define eight dimensions of unit morale and to develop scales for rating a unit's morale on those dimensions (community relations; teamwork and cooperation; reactions to adversity; superior-subordinate relations; performance and effort; bearing, appearance, and military discipline; pride in unit, Army, and country; and use of off-duty time). The questionnaires, inventories, and rating scales were field-tested by administering them to 466 enlisted men (representing 104 platoons and 16 companies) in the eighth Army (Korea), 614 soldiers (representing 47 platoons and 16 companies) in the Seventh Army (Germany), and 126 men in Minnesota National Guard units.

RN 79-31. Hadley, H. I. (American Institutes for Research). Army officer duty module manual. October 1975. (AD A081 265)

A unique personnel management system concept, the duty module, clusters tasks together statistically and logically so that jobs can be represented in a more specific manner than an MOS and with greater simplicity than task descriptions. This manual explains the steps already taken in developing duty modules and indicates the procedures for describing jobs in the rest of the Army branches, as well as procedures for reviewing and updating a duty module system.

RN 79-32. Davis, W. P., Hadley, H. I., Conmy, J. B., Jr., Marsh, C. N., Jr., & Wallis, M. R. (American Institutes for Research). Duty module methodology for officer career management system development: Catalogue of Army officer duty modules. October 1975. (AD A081 266)

A unique personnel management system concept, called the duty module, clusters tasks statistically and logically to represent jobs in a more specific manner than an MOS and with greater simplicity than task descriptions. This document provides a catalog of Army officer duty modules developed to date, listing within each module the tasks that make up that module.

RN 79-33. American Institutes for Research. Duty module methodology for officer career management system development: Task data bank index. November 1975. (AD A081 267)

A unique personnel management system concept, the duty module, clusters tasks statistically and logically in order to represent jobs in a more specific manner than an MOS and with greater simplicity than task descriptions. This document provides an index to the tasks that make up the duty modules described in companion volumes.

RN 79-34. American Institutes for Research. Duty module methodology for officer career management system development: Task data bank, task list. November 1975. (AD A081 268)

A unique personnel management system concept, the duty module, clusters tasks statistically and logically in order to represent jobs in a more specific manner than an MOS and with greater simplicity than task descriptions. This document is a listing of all the tasks that make up the duty modules described in companion volumes.

RN 79-35. Sitterson, J. D., Jr., & Wintersteen, J. O. Results of field survey to evaluate an experimental set of officer duty modules. January 1974. (AD A013 586)

Field surveys were conducted to test and evaluate an experimental set of 89 modules developed under another contract for representative jobs to which Infantry and Quartermaster officers are assigned. Four modules were added during the surveys, raising the total to 93. Surveys were conducted of officers from three division headquarters, six Infantry battalions, and six Quartermaster companies, plus a variety of supplemental individual surveys required for test coverage, yielding 518 usable survey returns. The results were analyzed by various means, including cluster analysis using the Computerized Occupational Data Analysis Program (CODAP).

The experimental set of duty modules was found generally valid in content, truly modular in terms of successful commonality and standardization, and in consonance with actual officer duties and assignment practices in the field. A few modules, although validly based, were not applied by the particular officers surveyed in the field, had low test frequencies, or needed minor refinement. However, most of the modules were validated. Of the officers surveyed, 96% stated that their test modules fitted and reasonably described their duties, and clear majorities responded favorably to a number of other questions testing the modules and officer reactions. The duty modules in this survey, with the addition of new specialized or "branch material" modules as required, would suffice as a basis for further field surveys and evaluations involving officers of other branches of the Army. The report includes appendixes on duty module design and on the relationship of officer duty modules to unit capabilities.

RN 79-36. Sitterson, J. D., Jr., Davis, W. P., & Korotkin, A. L. (American Institutes for Research). Development of criteria dimensions for evaluation of performance and career development of entry-level officers. November 1974. (AD A081 521)

Statements of "job performance dimensions" reflect salient aspects of job performance in entry-level positions across the 30 entry-level specialties of the Army's Officer Personnel Management System (OPMS). In the process, job schedules and duty modules developed under other contracts were examined and analyzed. A list of entry-level positions was developed. Duty module applications were analyzed, needs for additional duty modules were identified, and tentative headings for some of them were developed. Through processes of analysis, refinement, and coordination, a list of nine "job performance dimensions" was developed. A principal product of this research is a seven-part matrix (Appendix D) showing the relationship of the "job performance dimensions" and pertinent duty modules to entry-level positions, grouped by OPMS specialty.

RN 79-37. Korotkin, A. L., & Davis, W. P. (American Institutes for Research). Duty module relationships to training and experience requirements in career development and alternate specialty selections. February 1975. (AD A081 229)

Representative duty module coverage was developed in each of 46 different OPMS specialties. A matrix was developed reflecting 174 duty modules over 47 specialties in order to show skill similarity. A survey involving 440 respondents was administered to gather data regarding specialty training.

Current ARI research efforts are modifying and evaluating the duty module concept in order to provide a job component measure that is appropriate for use as a data element in a Training Information Feedback System. The final form of this data element will reflect a greater concern for criticality of tasks and for the feasibility of defining criterion-referenced standards corresponding to these tasks.

RN 79-38. Korotkin, A. L., & Davis, W. P. (American Institutes for Research). Design and validation of additional duty modules for Engineer and Ordnance officer positions. February 1975. (AD A033 794)

The American Institutes for Research (AIR) developed 41 additional duty modules for use in describing positions held by Engineer officers and Ordnance officers. These new duty modules, when used selectively with those developed in previous contracts, fully describe duty positions for Engineer and Ordnance officers in both MTOE and TDA types of organizations. A survey was administered to officers in both types of organizations to validate duty module descriptions of their positions. Three different survey methodologies were used in order to determine the most suitable procedure for future surveys.

RN 79-39. Korotkin, A. L., Hadley, H. I., Davis, W. P., & Marsh, C. N., Jr. (American Institutes for Research). Duty module methodology for officer career management system development. January 1976. (AD A081 157)

A unique personnel management system concept, called the duty module, is a product of a procedure for representing clusters of tasks which go together statistically and logically so that jobs can be represented in a more specific manner than an MOS and with greater simplicity than task descriptions. The duty module concept has great utility across the broad spectrum of requirements of a large scale personnel management system such as that found in the U.S. Army. This report summarizes research to refine, expand, and integrate the state of knowledge regarding duty modules into a coherent and useful system for application to the U.S. Army Officer Personnel Management System (OPMS).

A set of duty modules had previously been developed for the Infantry, Ordnance, Quartermaster, and Engineer branches. Although the primary goal of the current work was to refine and document the methods and procedures for developing and applying duty modules to OPMS, it was deemed useful to analyze positions from a new (fifth) Army branch as well. The branch selected was Armor. The complete set of current duty modules is now applicable across the five Army branches analyzed to date.

RN 79-40. Kress, G., & McGuire, W. J. (Human Resources Research Organization). Implementation and evaluation of the tank crew training program for USAREUR units. September 1979. (AD A079 371)

A previously developed tank crew gunnery training program for USAREUR units was tried out in a USAREUR armor battalion 4 weeks prior to tank gunnery qualification firing at the Baumholder Training Area. Tank crews in the test battalion trained exclusively on the prototype program. A second battalion, selected for comparison purposes, was trained "conventionally" by following their established training program. The training for both battalions was closely monitored. Both battalions later performed on Tank Crew Gunnery Table VI at Baumholder, and performance data were collected.

The prototype program was successfully implemented, requiring only minor modifications. Training on the prototype program was found to be as effective as conventional training in terms of meeting the Baumholder Training Area performance standards on Table VI.

RN 80-1. Matlick, R. K., Swezey, R. W., & Epstein, K. I. (Litton Mellonics Systems Development Division). Alternative models for individualized Armor training, part I, interim report: Review and analysis of the literature. January 1980. (AD A082 922)

This report presents a review and analysis of literature pertaining to individualized and/or self-paced instruction in educational, industrial, and military settings. It describes the major types of individualized or self-paced instructional systems that have been investigated or implemented, and it examines eight factors which vary among applications of methods of individualized instruction and which are held to strongly influence the feasibility

of methods for any given instructional environment (context). The eight controlling factors examined are (a) time available/required for learning; (b) instructional personnel; (c) facilities; (d) management; (e) student populations/learner characteristics; (f) course content/task types; (g) instructional methods; and (h) media, materials, and devices.

The review includes an examination of conceptual models of individualized instruction and the classification of those models. Generally, it shows that most established systems of individualized instruction are similar in terms of fundamental models and that many fundamental models are not represented by existing systems.

It reaches a number of conclusions of interest to training planners, developers, and managers. Generally, these conclusions point to the need for care in the selection of approaches to individualization of instruction, to unexplored approaches to individualization, and to the need for further research and development.

RN 80-2. Jones, D. R., Jr., Wylie, P. B., Henriksen, K. F., Shriver, E. L., & Hannaman, D. L. (Kinton, Inc.). Battle simulation board games: An analysis in terms of design characteristics and leader skills. January 1980. (AD A082 930)

The objective of this effort was to analyze three small unit battle simulation board games in terms of design characteristics, leader skill practice opportunity, and psychological fidelity.

Three battle simulation board games--Tactical Opposition Exercise (TOX), Small Combat Unit Evaluation (SCUE), and Dunn-Kempf--were rated by the authors with respect to (a) their administrative and design characteristics, (b) the degree to which they provide leaders with an opportunity for practicing leader skill, and (c) the degree to which they provide fidelity, i.e., require players to perform the same action as required in combat or engagement simulation exercises.

Differences were found among the three battle simulation board games with respect to administrative and design characteristics, fidelity, and opportunity to practice leader skills. In general, TOX and SCUE received their highest ratings for training on problem-solving and communication skills, whereas Dunn-Kempf received its highest ratings for training on technical skills, such as terrain analysis.

RN 80-3. Shriver, E. L., Henriksen, K. F., Jones, D. R., Jr., & Onoszko, P. W. J. (Kinton, Inc.). Development of a leader training model and system. January 1980. (AD A082 750)

This research developed a preliminary theoretical model specifying the nature and sequencing of training for leaders in an engagement simulation environment. An interaction training model and system (squad through company level) with three distinct learning processes--experiential, analytic, and procedural--was developed. The model addresses identified leader skills

and different levels of simulation training. The system further specifies administrative and logistical procedures for conducting training.

RN 80-4. Pask, G. (System Research, Ltd.). *Cognitive mechanisms and behaviours involved in other than institutional learning and using Principles of Decision*. February 1980. (AD A084 066)

This report describes studies of individual and team decision making in complex command, control, and communication systems involving man-machine and computer-regulated interaction. The most recent advance is a comprehensive team decision system able to exteriorize normally hidden conceptual operations as behavioral records. The system has training, testing, and operational applications. It incorporates an on-line, novel concept, interrogation system, records for which (together with logging the condition of a space environment) provide indices of decision-making style and performance which are compared with data from (also novel) tests for learning style. The system also incorporates a computer-implemented planning and representation method as well as an environment in which the decision process is instituted by essential bifurcations. The method is a microbehavioral conversation, based on conversation theory, from the conversation laboratory studies.

RN 80-5. Bonder, S., Cherry, W. P., & Farrell, R. L. (Vector Research, Inc.). *A framework for identifying human factors research needs in command and control*. March 1980. (AD A083 011)

This effort developed a framework¹ to assist in identifying human factors research areas in command and control (HF/C²) of importance to the Army. It is a systems-oriented framework that considers HF/C² activities needed to assist in developing Army systems and HF/C² knowledge required/available to generate a menu of potential HF/C² research needs by type of research (Application Demonstration, Applied Research, and Exploratory Research). The framework also provides information regarding the time when the research output will be of first use to the Army.

RN 80-6. Hill, H. G., & Kress, G. (Human Resources Research Organization). *Development of a methodology for measuring transfer of training effects for tactical training systems*. September 1979. (AD A082 707)

A methodology for the measurement of transfer of training between a battle simulation (Dunn-Kempf) and a tactical field exercise (REALTRAIN) was developed. The methodology is based on evaluation of tactical performance in company-level combined arms exercises (offensive mission) in both training environments. This report documents the development, tryout, and refinement of a tactical performance evaluation instrument and discusses the development and use of an evaluator training program.

Attached to the report is research plan for determining the reliability of measurement for the instrument developed during this study and for conducting a transfer of training experiment between Dunn-Kempf training exercises and REALTRAIN field exercises.

The report and the performance evaluation instrument have application for evaluating the effectiveness of tactical training for company/team leaders.

RN 80-7. Sgro, J. A., Pence, E. C., & Orban, J. A. (Virginia Polytechnic Institute and State University). Performance-based leadership development in organizational settings. September 1979. (AD A081 422)

Development of a model of leadership that is performance based and may be used at the precommissioned officer level is presented. The report has four sections. Section I is an introduction to leadership in the military with an emphasis on the present issues facing the newly commissioned lieutenant. Section II is a review of 12 contemporary theories of leadership. Section III presents a model of leadership specific to the role of lieutenant. The model describes leadership in terms of the organizational maturity of both the lieutenant and his or her subordinates. Basic leadership skills necessary for the lieutenant are derived from the model and presented in Section IV. Behaviorally formatted exercises are given for each leadership skill.

RN 80-8. Hadley, H. I. (American Institutes for Research). The design of a system of job analysis for duty positions that Infantry and Quartermaster officers fill. December 1973. (AD A081 307)

An extensive survey of job analysis literature was made prior to deciding whether a multipurpose job analysis system could be used to analyze Army officer jobs. It was concluded that a job analysis system which would meet the needs of both personnel management and training course curriculum construction would be impractical. A new and specific job analysis format was then designed to gather job data relevant to the needs of officer job and career counseling. The method and field administration procedures employed are both explained. Grouping and summarizing the job data are also discussed, and examples of a tentative grouping system are explained. Statistical testing of the job analysis system designed and the job dimensions isolated remains for future work, when a larger sample is gathered. Preliminary indications are that the method is highly successful in the purpose for which it is designed.

RN 80-9. Schechterman, M. D., & Levi, L. R. (Integrated Sciences Corporation). Dynamic displays for tactical planning. Volume III: Software documentation. December 1979. (AD A091 565)

Volume III of the three-volume set contains detailed documentation of computer software used to support research on two-sided, user-controlled, dynamic wargaming. This volume is intended for systems programmers and technical personnel interested in specifics of implementation. Complete program listings are provided. The project emphasizes that a battlefield planner can work in harmony with computer graphics to structure and analyze battlefield situations. Special tactical displays and dynamic replays of events are designed to aid the planner.

Volume I, published as ARI Research Report 1247, provides a functional description of the research for Army managers, command staffs, and other potential users of the concepts. Volume II, ARI Technical Report 455, is

intended for readers with specialized interests in research and development of interactive graphics for battlefield applications.

RN 80-12. Witus, G., Blum, R. W., & Meerschaert, M. (Vector Research, Inc.). Analysis of information flow in the Tactical Operations System (TOS). November 1979. (AD A092 205)

This report describes the results of an analysis of the Tactical Operations System (TOS) communications subsystem performed in the second phase of a project to develop information management concepts and procedures for automated battlefield command and control systems. The research effort evolved from previous work to develop a design/decision aid (DDA) for the evaluation of alternative information management policies. The original DDA model was concerned exclusively with the Division Computing Center. The original effort was expanded to encompass both the distributed processors--the Tactical Computer Systems and Tactical Computer Terminals--and the supporting communications. The resulting model not only provides a tool for the analysis of TOS and its component parts, but also has the potential for application to other distributed command support systems with a central node and data base.

RN 80-13. Witus, G., Blum, R. W., & Graulich, M. (Vector Research, Inc.). Description of the Tactical Operations System information flow model. November 1979. (AD A092 206)

This report describes a mathematical model of the Division Tactical Operations System (DIV TOS) developed during the second phase of a project to develop information management concepts and procedures for automated battlefield command and control systems. The research effort evolved from previous work to develop a design/decision aid (DDA) for the evaluation of alternative information management policies. The original DDA model was concerned only with the Division Computing Center. The original effort was expanded to encompass both the distributed processors--the Tactical Computer Systems and Tactical Computer Terminals--and the supporting communications. The resulting model not only provides a tool for the analysis of TOS and its component parts, but also has the potential for application to other distributed command support systems with a central node and data base.

RN 80-14. Witus, G., Meerschaert, M., & Kleist, D. (Vector Research, Inc.). User's manual for the Tactical Operations System analysis package. February 1980. (AD A092 207)

This document provides instructions for the use and operation of a computer program package for the analysis of the Tactical Operations System (TOS). These programs were produced during the second phase of a project to develop information management concepts and procedures for automated battlefield command and control systems.

RN 80-15. Witus, G., Meerschaert, M., & Kleist, D. (Vector Research, Inc.). Programmer's manual for the Tactical Operations System analysis package. February 1980. (AD A092 208)

This document discusses the programming details of a computer program package for the analysis of the Tactical Operations System (TOS). The program computer code is included. These programs were produced during the second phase of a project to develop information management concepts and procedures for automated battlefield command and control systems.

RN 80-16. Finch, F. L., Rigg, K. E., & Gray, B. B. (McFann Gray & Associates, Inc.). Personnel requirements consideration in major weapon system acquisition research planning report, final report. March 1980. (AD A087 016)

The objective of this effort was to produce a plan of research for development of a model and methodology for deriving a direct relationship between aptitude measures and task analysis procedures early in the process of weapon system research, development, and acquisition.

A literature review indicated that past attempts to link behavioral requirements with human attributes have not been successful. A recent effort suggested further that these approaches are ultimately not feasible. That effort, as with all the others reviewed, would require a highly specialized and lengthy application for most tasks in every job in every new system and for each phase within the system. Such procedures are slow and expensive. There is a need for a procedure that can be applied in a direct and simple manner.

The current effort has resulted in a research plan based upon a conceptual design for a branching decision logic that will provide measures of personnel requirements while avoiding detailed analysis of nonrelevant factors. Implementation of this plan will result in construction and pilot testing of a computer-based branching decision logic in 1980-81 and field testing and evaluation in 1981-82.

Research Products

RP 79-1. Bosley, J. J., Blanton, R., & Onoszko, P. W. J. (Human Sciences Research, Inc.); & Knerr, C. S., & Root, R. T. (ARI). Tactical engagement simulation training techniques: REALTRAIN for armored cavalry platoons. January 1979. (AD A073 723)

Armored cavalry units differ in certain important aspects from other combat arms units. These differences necessitated a research program, including a series of field tests, to develop appropriate modifications to basic engagement simulation techniques to meet the unique performance requirements of armored cavalry platoons.

Field research was carried out to develop and refine engagement simulation techniques to support armored cavalry tactical training. As a first step in this research program, exercise control procedures and rules of engagement were developed by research personnel to support armored cavalry engagement

simulation training. Weapon signature simulation techniques for armored cavalry weapons for which simulation techniques did not exist were also developed. These were tested in a series of field tests. These field tests were developmental in nature rather than validations of a completed system.

1. Procedures designed to emphasize the reconnaissance functions of the armored cavalry platoon in ES exercises.
2. Procedures for incorporating feedback on reconnaissance performance into the After Action Review conducted following each exercise.
3. Controller procedures and the exercise control system, and
4. The effectiveness of the weapons effects and signature simulators for armored cavalry weapons.

These tests were the first time in engagement simulation training exercises that an indirect fire weapon--in this case, the 4.2-inch (107mm) mortar--was incorporated physically into exercise play.

The tests allowed research personnel to observe their developmental product in the hands of a representative user on two occasions. Researchers' observations, wherever possible buttressed by objective data, were used to refine the developmental product. The training circular that comprises the major portion of this report is the visible product of this research.

RP 79-2. Bosley, J. J., & Onoszko, P. W. J. (Human Sciences Research, Inc.); & Knerr, C. S., & Sulzen, R. H. (ARI). Improved tactical engagement simulation training techniques: Two training programs for the conduct of After Action Reviews. January 1979. (AD A073 724)

The employment of an After Action Review (AAR) following engagement simulation exercises--during which exercise events are reviewed by exercise participants chronologically--helps to clear away the "Fog of War." Maybe most importantly, AAR participants also get to review the exercise from the perspective of the opposing side. Battle reconstruction gives each participant a better idea of unit and individual actions that led to mission success (or failure) and what part his actions played in the course of battle. In subsequent exercises, the individual can apply behaviors that have proven successful in earlier battles under similar circumstances.

The training benefit from the After Action Review (AAR) can be substantial. However, the techniques employed by the leader of an AAR are quite different than usual military training practice. Without specific guidance on how to conduct an effective AAR, leaders are unlikely to obtain the most beneficial training from engagement simulation. Efforts to refine REALTRAIN have led to research on the most appropriate behaviors for leaders of the After Action Review. The draft training document that forms the body of this report is one product of this research and has been written to provide specific guidance on how to conduct an effective AAR for small combat arms units employing REALTRAIN or other engagement simulation techniques.

RP 79-3. Sevilla, E. R. (Human Sciences Research, Inc.). Tactical engagement simulation training techniques: Indirect fire simulation procedures. January 1979. (AD A073 725)

An integral part of tactical engagement simulation training is the simulation of indirect fire weapons and their effects. Mortar and artillery fire represent important sources of firepower to the tactical commander; the opportunity must be given for him to learn the proper employment of this combat asset.

The indirect fire simulation procedures described in Training Circular (TC) 71-5, REALTRAIN, cover only indirect fire simulation for engagement simulation exercises at the platoon level and below and involve only the play of the Forward Observer and the simulation of incoming rounds. Not included in TC 71-5 are refined indirect fire simulation procedures for platoon and below, simulation procedures for larger size units, procedures for including the artillery Fire Direction Center as part of the exercise, or procedures for including the firing element itself into exercise play.

The indirect fire simulation Training Circular which comprises the major part of this document is the result of research on improved and expanded procedures for integrating all aspects of indirect fire simulation into tactical engagement simulation training. Most of the indirect fire simulation procedures described in the training circular have been tried out in the field (usually as part of a larger test effort); those procedures not subjected to test in the field are logical extensions of procedures for smaller size tactical units.

This Training Circular has been written for the user in the field. It describes the duties of the personnel required for effective indirect fire simulation, delineates the staffing and organization of facilities required for control of indirect fire simulation in the context of engagement simulation exercises, and presents a detailed description of procedures to be followed.

RP 79-4. Shriver, E. L., Griffin, G. R., Hannaman, D. L., & Jones, D. R., Jr. (Kinton, Inc.). Small combat arms unit leader training techniques: Rules of play for two-player/multiplayer infantry mapboard games. January 1979. (AD A077 476)

The objective of this project was to develop and evaluate simulation techniques for training small unit leaders that would provide maximum tactical decision-making training while minimizing the unnecessary, and often wasteful, participation of lower level troops. The fundamental approach of this research effort was to take some of the basic instructional principles underlying engagement simulation and to develop abstractions of field exercises for leader training.

Initial efforts led to the development of a mapboard game. The board game initially developed was a two-sided, free-play map exercise for teaching infantry tactics to small unit leaders at the platoon level. Junior officers were to play the game to develop tactical skills that they would subsequently apply during REALTRAIN exercises with troops.

It was found, however, that for the benefits of this training to be fully realized, leaders had to have an opportunity to learn to work with their NCOs and then to practice what they had learned in the field both with and without troops. A variation of the basic game simulation was developed to permit the unit leader team (platoon and squad leaders) to work together on the board game as they would during an actual engagement.

The products of this research have been (a) an infantry squad/platoon level game for two-player or multiplayer use, (b) an infantry squad/platoon level field opposition exercise, and (c) a combined arms platoon/company level mapboard game. This report contains documentation in the infantry squad/platoon level game. Separate reports document the other two training techniques. ARI Research Report 1219 summarizes the research activities conducted to develop these research products.

RP 79-5. Shriver, E. L., Griffin, G. R., Hannaman, D. L., & Jones, D. R., Jr. (Kinton, Inc.). Small combat arms unit leader training techniques: Rules of play for infantry field opposition exercise. January 1979. (AD A073 794)

The objective of this project was to develop and evaluate simulation techniques for training small unit leaders that would provide maximum tactical decision-making training while minimizing the unnecessary, and often wasteful, participation of lower level troops. The fundamental approach of this research effort has been to take some of the basic instructional principles underlying engagement simulation and to develop abstractions of field exercises for leader training.

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The products of this research have been (a) an infantry squad/platoon level game for two-player or multiplayer use, (b) an infantry squad/platoon level field opposition exercise, and (c) a combined arms platoon/company level mapboard game. This report contains documentation on the infantry squad/platoon level field opposition exercise. Separate reports document the other two training techniques. ARI Research Report 1219 summarizes the research activities conducted in the development of these research products.

RP 79-6. Shriver, E. L., Griffin, G. R., Hannaman, D. L., & Jones, D. R., Jr. (Kinton, Inc.). Small combat arms unit leader training techniques: Rules of play for combined arms mapboard game. January 1979. (AD A073 754)

The objective of this project was to develop and evaluate simulation techniques for training small unit leaders that would provide maximum tactical decision-making training while minimizing the unnecessary, and often wasteful, participation of lower level troops. The fundamental approach of this research effort has been to take some of the basic instructional principles underlying engagement simulation and to develop abstractions of field exercises for leader training.

Initial efforts led to the development of a mapboard game. The board game initially developed was a two-sided, free-play exercise for teaching infantry tactics to small unit leaders at the platoon level. Junior officers were to play the game to develop tactical skills that they would subsequently apply during REALTRAIN exercises with troops.

It was found, however, that for the benefits of this training to be fully realized, leaders had to have an opportunity to learn to work with their NCOs and then to practice what they had learned in the field both with and without troops. A variation of the basic game simulation was developed that would permit the unit leader team (platoon and squad leaders) to work together on the board game as they would during an actual engagement.

The products of this research have been (a) an infantry squad/platoon level game for two-player or multiplayer use, (b) an infantry squad/platoon level field opposition exercise, and (c) a combined arms platoon/company level mapboard game. This report contains documentation on the combined arms platoon/company level mapboard game. Separate reports document the other two training techniques. ARI Research Report 1219 summarizes the research activities conducted in the development of these research products.

RP 79-7. Havron, M. D., McCullough, T. J., & McFarling, L. H. (Human Sciences Research, Inc.); & Wanschura, R. G. (ARI). Improved ARTEP methods for unit evaluation. Volume IV: Guidance for planning and conduct of company-level field exercises. April 1979. (AD A075 470)

This document provides guidance for exercise planners and evaluator/controller teams responsible for planning and conducting platoon and company tank/mechanized infantry field exercises. It contains a command planning guide that addresses basic ARTEP training/evaluation principles, choice of missions, scenario development, evaluator/controller selection and training, sequences of exercise events and monitoring of the evaluator/controller team. Also included is a program of instruction for evaluator/controller training. Fifteen separate lesson plans cover evaluator/controller duties, exercise planning, exercise control and communication, simulation, performance observation and evaluation, exercise rehearsal, terrain reconnaissance, conduct of critiques, and data analysis/report preparation. Each lesson includes example lesson narratives, graphics, and trainee handouts.

Another section of the document presents the rationale for the content of the command planning guidance and program of instruction. A final section

describes the field testing and revision of earlier guidance that led to the guidance in the present document. Primary audiences for this document are researchers, TRADOC personnel responsible for tank/mechanized infantry collective training/evaluation, and tank/mechanized infantry unit training managers seeking additional guidance in exercise planning and evaluator/controller training.

RP 79-8. NOTE: This paper has been superseded by RPs 80-4a, b, and c.

RP 79-10. Yeager, R. F. (Champaign, Ill.); & Simutis, Z. M. (ARI). Computer-based electronics maintenance training: Description of lessons. September 1979. (AD A075 461)

A series of computer-based lessons were developed on the University of Illinois PLATO System for use in research in game-based training. These lessons provide instruction and practice in reading logic symbols, logic diagrams, and electronics troubleshooting. This report describes the available lessons and management routines to interested instructors and trainers of electronic maintenance.

RP 79-11. Medlin, S. M., Mirabella, A., Epstein, K. I., Boycan, G. G., & Wanschura, R. G. Multiple Integrated Laser Engagement Simulation (MILES) Training and Evaluation Test (TET) evaluator guidebook. September 1979. (AD A075 247)

The purpose of this guidebook is to train the senior controller/evaluator and his staff in how to conduct an external evaluation of an Army Training and Evaluation Program (ARTEP) exercise and how to provide feedback that can be used to structure subsequent training programs. The instruction includes how to observe a field exercise, what to observe, how to record observations, and how to use observations to provide feedback to the unit. Data collection instruments and feedback procedures are presented and described. The appendixes include a sample training and evaluation outline, a sample feedback package, sample data forms, and sample activity record cards. This document serves as a textbook during evaluator training and can be used as a reference to answer questions that may arise during the evaluation of field exercises.

RP 79-12. Drillings, M. Handbook for sight picture training. October 1979. (AD A077 318)

This handbook was developed as a research instrument for research on retention of sight picture skills. It consists of instructional material on the M60A1 tank sight reticles. The material is self-paced, performance based, and self-correcting. Soldiers place plastic reticles on targets in response to fire commands. They then examine a picture of the correct sight picture to determine if they are in error.

RP 79-13. O'Brien, R. E., Harris, J. H., Osborn, W. C., & Healy, R. D. (Human Resources Research Organization). Tank crewman (M60A1) readiness test. November 1979. (AD A082 569)

This document provides tests and administrative guidance for evaluating M60A1 tank crewman job readiness. General procedures, time estimates, and support equipment for using the tests in a unit setting are given first. Remaining sections of the report give detailed test administration and scoring procedures for the crew positions, driver, loader, gunner, and tank commander.

The tests cover knowledge and skill aspects of the important crewman tasks: those tasks that are most relevant to crew gunnery proficiency. The tests are designed for use by the unit commander in diagnosing crewmen abilities in conducting before-operations checks; disassembling and assembling weapons; and driving, loading, and shooting in a tactical setting. When used with the three companion documents, ARI Research Products 79-14, 79-15, and 79-16, the readiness tests provide an integrated "train-up" package for annual gunnery evaluation.

RP 79-14. O'Brien, R. E., Harris, J. H., Osborn, W. C., & Healy, R. D. (Human Resources Research Organization). Tank crewman (M60A1) training modules. November 1979. (AD A082 686)

This document provides training outlines and administrative guidance for promoting M60A1 tank crewman readiness. Administrative guidance, time estimates, and equipment requirements for training are given first. Remaining sections of the report are detailed outlines of training for the crew positions, driver, loader, gunner, and tank commander.

The training outlines address knowledge and skill aspects of the important crewman tasks: those tasks that are most relevant to crew gunnery proficiency. The training is designed for use by the unit commander in promoting proficiency in the conduct of before-operations checks; disassembling and assembling weapons; and driving, loading, and shooting in a tactical setting.

RP 79-15. O'Brien, R. E., Harris, J. H., Osborn, W. C., & Healy, R. D. (Human Resources Research Organization). Tank crew (M60A1) performance exercise. November 1979. (AD A082 706)

This document provides test exercises and administrative guidance for evaluating the readiness of M60A1 tank crews. Administrative guidance and equipment requirements for crew testing are given first. Remaining sections of the report present crew performance exercises for preparation for operations and for tactical operations. The crew performance exercise is designed for use by unit commanders in assessing mastery of tasks requiring interaction by crew members.

RP 79-16. O'Brien, R. E., & Crum, W. J. (Human Resources Research Organization). Program management for tank crewman skills training program. November 1979. (AD A082 531)

This document explains the development of the Tank Crewman Skills Training Program and provides guidelines for managing the program. General developmental procedures for diagnostic testing and remedial training are given first. Remaining sections of the report give detailed program management guidance for training managers and trainers about training responsibilities, required training resources, administering readiness tests and training modules, and maintenance of training records.

When used with three companion documents, ARI Research Products 79-13, 79-14, and 79-15, the program management for tank crewman skills training program provides guidance for implementing an integrated "train-up" package for annual gunnery evaluation.

RP 79-17. Kraemer, R. E., & Kristiansen, D. M. A prototype crew drills training program for XM1 tank gunnery: Company commander's manual. November 1979. (AD A078 499)

This report presents a prototype XM1 tank gunnery crew drills training program designed to support ongoing ARI research concerned with the design and development of Armor training structures. This research focused on the design of collective training components for Armor gunnery tasks and is responsive to the needs arising from the introduction of the XM1 main battle tank into the Armor inventory.

Two major objectives were accomplished. First, 14 crew drills were identified as representative of basic XM1 tank gunnery engagements, and behaviorally analyzed. Performance prescriptions detailing both individual and crew gunnery behaviors were developed for each crew drill requirement, along with performance checklists for assessing crew performance. Administrative, training, and evaluation specifications designed to structure training were also developed. Second, a collective training model was formulated that specified the training approach and supporting systems necessary to manage and perform quality control of crew drill training. A training matrix, designed to promote intermediate and advanced tank gunnery proficiency, and training selection algorithms, designed to aid training assignment, were also developed as part of the training program.

RP 79-18. Siebold, G. L. Manual for the Racial Attitudes and Perceptions Survey (RAPS). November 1979. (A078 475)

The manual was developed to enable Army personnel to use the Racial Attitudes and Perceptions Survey (RAPS). The RAPS is a 40-minute, paper-and-pencil questionnaire that measures the attitudes and perceptions of military personnel on racial matters as they are experienced in daily life. Its primary purpose is to provide objective information to the installation commander to aid him in his general program to promote racial harmony.

The manual contains the RAPS, a description of its history and structure, specific directions for administering and scoring it, and guidelines for interpreting the results. The manual lists the personnel (and their capabilities) needed to conduct the survey and provides instructions on how to carry out their functions. Sample materials are included.

RP 80-1. Dalziel, M. M., Klemp, G. O., Jr., & Cullen, B. J. (McBer and Company); & Duffy, P. J., & Nogami, G. Y. (ARI). Army Work Environment Questionnaire (WEQ) manual. May 1980. (AD A088 338)

The Work Environment Questionnaire (WEQ) was designed as a measure of organizational climate that relies on description of observable aspects of the work environment rather than on attitudes about work or job satisfaction. WEQ items were selected based on a critical incident analysis of work issues raised by enlisted men in ranks E-1 through E-9. Thirteen scales nested within four organization levels were derived based on analyses of data from infantry, artillery, armor, and support units at one installation and were cross-validated on similar units at another installation. Scale scores were found to be related significantly to hard outcome measures (ARTEP, IG rating, AWOL rates, and reenlistment), morale measures (operational readiness, people reporting to work unable to perform), and perceived measures (DR rate, accident rate, and miscellaneous inspection scores). The final version of the WEQ, containing 70 items, gives the Organizational Effectiveness Staff Office (OESO) access to scores reflecting actual conditions as well as scores reflecting a pressure for changing those conditions. The WEQ is presented as a diagnostic and prescriptive instrument to be used by the OESO in planning an organizational effectiveness intervention.

This report includes the development of the WEQ instrument; sample WEQs for enlisted and NCO, officers and civilians; instructions for WEQ administration, data coding, and processing; and data interpretation.

RP 80-2. VanWert, J. R. (Applied Science Associates, Inc.); Shields, J. L. (ARI); & Joyce, R. P. (Applied Science Associates, Inc.). Squad Leader's Guide for the Chaparral skill retention research. March 1979. (AD A102 564)

The Squad Leader's Guide was an integral part of the Chaparral skill retention experiment and appears as an appendix of that report (ARI Research Report 1205). For the experiment, this guide provided squad leaders with general information concerning performance-based testing and specific instructions for the conduct of the experiment. Beyond the experiment, this guide is a training aid that presents general techniques for effective task demonstrations and specific instructions and references for the efficient training/ refresher training of selected Chaparral missile tasks.

RP 80-3. Bessemer, D. W., & Kottas, B. L. Use of computer statistical packages to generate quality control reports on training. January 1980. (AD A086 085)

Obtaining timely and efficient training management information using limited computer resources and commercially available statistical packages

may be difficult in practice. The Training Monitoring System (TRAMS) uses the Statistical Package for the Social Sciences to provide graphic summaries and statistical analysis of personnel attitudes before, during, or after training and can also evaluate changes in attitudes over training. TRAMS takes input from cards during batch processing and produces graphic displays similar to quality control charts. The output allows a rapid detection of deviant samples and systematic changes in attitudes over time. The system is readily adaptable to evaluation of training data other than attitudes, such as test scores, and easily provides ongoing monitoring of training results.

RP 80-4a. Siegel, A. I., Pfeiffer, M. G., Kopstein, F. F., & Wilson, L. G. (Applied Psychological Services, Inc.); & Ozkaptan, H. (ARI). Human performance in continuous operations: Volume I. Human performance guidelines. December 1979. (AD A086 131)

This document provides guidelines to the military commander on expected human performance degradation of continuous ground combat. Degradation projections are based on extrapolations from scientific literature and realistic scenarios of continuous operations.

The advantages and application of task restructuring, task reallocation, and work rest management concepts in the continuous operations context are presented along with considerations for training, system design, and performance support.

Comprehensive tables show anticipated performance degradation for specific duty positions in the mechanized infantry, artillery, armor, and FIST categories. Methods are discussed for minimizing the anticipated degradation.

RP 80-4b. Kopstein, F. F., Siegel, A. I., & Wilson, L. G. (Applied Psychological Services, Inc.); & Ozkaptan, H. (ARI). Human performance in continuous operations: Volume II. Management guide. December 1979. (AD A086 155)

Guidelines are presented for the management of human resources relative to maximizing unit effectiveness during continuous operations. Concrete ground rules for personnel management are presented vis-a-vis continuous operations. Steps to take prior to actual combat are given along with methods for controlling performance degradation during continuous operations. Projected soldier effectiveness as a function of battle length and type of unit is presented.

RP 80-4c. Siegel, A. I., Pfeiffer, M. G., Kopstein, F. F., & Wolf, J. J. (Applied Psychological Services, Inc.); & Ozkaptan, H. (ARI). Human performance in continuous operations: Volume III. Technical documentation. March 1980. (AD A088 339)

This is the third volume of a series dealing with human performance in continuous operations. This volume documents the technical procedures used to analyze adverse effects and to project diminished human performance capabilities during continuous operations, as described in volumes I and II of

this series. Specifically, this present volume (a) depicts the technical aspects of the development of the prior two volumes, (b) updates a prior survey of the literature concerning the effects of continuous operations on military performance, (c) describes the methods for deriving "critical" tasks included in volume I, (d) describes the details of the mathematical procedures employed in volume I to calculate and compound projected performance effectiveness, and (e) describes the details of a computer simulation model, which incorporates human effects, for simulating human performance in continuous operations.

RP 80-5a. Myers, D. C., Gebhardt, D. L., & Fleishman, E. A. (Advanced Research Resources Organization). Physical performance standards for Army jobs: Criterion task manual. May 1980. (AD A086 156)

This manual lists the tasks of four Army jobs rated by incumbents as the most physically demanding and the most critical, on the following dimensions: upper body strength (static, dynamic, explosive), lower body strength (static, dynamic, explosive), trunk strength, stamina, consequences of inadequate performance, delay tolerance, and learning difficulty. The jobs are Infantryman, Combat Engineer, Armor Crewman, and Military Police. Research has indicated acceptable reliability for the rating procedure, and the manual indicates some additional utility outside of the military setting.

RP 80-5b. Myers, D. C., Gebhardt, D. L., & Fleishman, E. A. (Advanced Research Resources Organization). Physical performance standards for Army jobs: Procedures manual. May 1980. (AD A086 147)

This manual outlines a procedure for determining the physical ability requirements of Army jobs without requiring a great deal of time and effort on the part either of analyst personnel or job incumbents. The manual is arranged in three sections: (a) task analysis, (b) physical abilities analysis, and (c) data analysis and presentation of results. Each section describes in detail the steps necessary to carry out this scaling of physical task demands, for which research has indicated acceptable reliability.

RP 80-8. Goldberg, S. L. Howitzer fire mission handbook. April 1980. (AD A085 868)

This workbook is a pocket-sized, performance-oriented training aid designed for field use. It contains four practice sessions that each take about 1 hour to complete. Each session consists of a number of dry-fire direct and indirect fire missions and two evaluation missions. The evaluation missions allow sections to keep track of their performance. The workbook can provide drill to gunners and assistant gunners and cross-training for other howitzer section members.

RP 80-9. Data Systems Division, Litton Systems, Inc. PLANIT support programs, version 4.0, operator/user manual. May 1977. (AD A085 116)

This document presents the general operational information and specific procedural data for the operation and use of the Programming Language for Interactive Teaching (PLANIT) support programs. These programs were developed as a part of the system installation of PLANIT on the AN/GYK-12 (TACFIRE) computer.

RP 80-10. Data Systems Division, Litton Systems, Inc. PLANIT Utility Program--PUPTWO user manual. August 1976. (AD A082 777)

This document is a user's manual for the revised Programming Language for Interactive Teaching (PLANIT) Utility Program (PUPTWO), which executes on the AN/GYK-12 (V) computer under the Programming Support System (B) Operating System (PSS/OS). PUPTWO contains specialized utility routines to accomplish specific tasks in support of the installation of PLANIT, and it will run in any PSS/OS system.

RP 80-11. Data Systems Division, Litton Systems, Inc. Design description document for PLANIT system enhancement. April 1977. (AD A082 778)

This document presents the design changes that allow a PLANIT lesson to control ACC/OCC, VFMED, and MIOD terminals so that TACFIRE/TOS² systems operations can be simulated under PLANIT.

RP 80-12. Data Systems Division, Litton Systems, Inc. User manual for Short System Tape Generator (SSTGEN). May 1977. (AD A082 879)

This document is a user's manual for the Short System Tape Generator (SSTGEN), a utility program that executes on the AN/GYK-12(V) computer under the Programming Support System (B) Operating System (PSS/OS). SSTGEN converts compiler object decks and data decks into a system load tape, compatible with PLANIT and MADCAP system loading and operation. Input may be from cards, commercial tape, or disk; output is to commercial tape, Tape Transport Cartridge (TTC), or punched cards.

RP 80-25. Lenzycki, H. P. (Dunlap and Associates, Inc.); & Finley, D. L. (ARI). How to determine training device requirements and characteristics: A handbook for training developers. May 1980. (AD A088 552)

This handbook was prepared for use by U.S. Army training developers and others accountable for determining requirements for and characteristics of training devices to support hardware fielding. It contains a description of a methodology for performing the front-end analysis needed to determine what tasks have to be trained (training requirements); the need for a training device(s) as a medium for developing required task skills (training device requirements); and the characteristics that the device should possess to promote effective learning (training device characteristics).

The handbook supplements and extends the contents of ISD Pamphlet 350-30 in that it (a) further details the process for developing task descriptions and acquiring other job information needed to assess the demands imposed on the operator by the equipment, operational environment, other crew members, and interactive systems; (b) provides additional criteria and rating scales for use in the task analysis process; (c) allows for specific identification of requirements for training equipment (actual or device) as opposed to the ISD process which leads to the identification and selection of generic training media alternatives; and (d) leads to the identification of specific characteristics of devices needed to provide the essential skills training.

INDEX

Authors

- Adams, J., 19
Advanced Research Resources Organization, 18, 41
American Institutes for Research, 19, 23, 24, 25, 26, 29
Anshel, M. H., 17
Applied Psychological Services, Inc., 10, 40
Applied Science Associates, Inc., 11, 39

Bessemer, D. W., 8, 13, 39
Blair, J. D., 20, 21, 22
Blanton, R., 31
Blum, R. W., 4, 30
Bonder, S., 28
Bonner, B. E., 19
Borman, W. C., 23
Bosley, J. J., 31, 32
Boycan, G. G., 36

Callahan, C., 4
Campbell, C. H., 5
Carswell, W. A., 6
Cherry, W. P., 28
Conmy, J. B., Jr., 23
Crum, W. J., 38
Cullen, B. J., 39

Dalziel, M. M., 39
Data Systems Division, Litton Systems, Inc., 42
Davis, W. P., 23, 25, 26
Dowdell, F. E., 21
Drillings, M., 36
Duffy, P. J., 39
Dunlap and Associates, Inc., 42
Dunnette, M. D., 23

Eaton, N. K., 8
Epstein, K. I., 11, 26, 36

Farrell, J. P., 13
Farrell, R. L., 28
Finch, F. L., 31
Fink, C. D., 6
Finley, D. L., 42
Fleishman, E. A., 18, 41
Florida State University, 14, 17

Gade, P. A., 17
Gebhardt, D. L., 18, 41
Geiselman, R. E., 4, 7
General Research Corporation, 19
Goehring, D. J., 13
Goldberg, S. L., 41
Granda, T. M., 5
Graulich, M., 4, 30
Gray, B. B., 31
Griffin, G. R., 33, 34, 35
Griffith, D., 15

Hadley, H. I., 23, 26, 29
Hagman, J. D., 9, 14
Halpin, S. M., 7
Hamill, B. W., 16
Hannaman, D. L., 16, 27, 33, 34, 35
Harris, J. H., 5, 37
Havron, M. D., 35
Hayes, J. F., 19
Healy, R. D., 37
Henriksen, K. F., 16, 27
Hill, H. G., 28
Human Resources Research Organization, 5, 6, 26, 28, 37
Human Sciences Research, Inc., 31, 32, 33, 35
Hunt, R. M., 14
Hyman, A., 17

Indiana University-Purdue University at Indianapolis, 12
Integrated Sciences Corporation, 29

Johnson, E. M., 7
Johnson, P. D., 23
Johnson, R. M., 17
Johnson, W. B., 14, 15
Jones, D. R., Jr., 16, 27, 33, 34, 35
Joyce, R. P., 39

Katter, R. V., 3, 5, 18
Kinley, W., 4
Kinton, Inc., 6, 16, 27, 33, 34, 35
Kleist, D., 30, 31
Klemp, G. O., Jr., 39
Knerr, C. S., 31, 32
Kopstein, F. F., 40
Korienek, G. G., 14

Korotkin, A. L., 25, 26
 Kottas, B. L., 13, 39
 Kraemer, R. E., 38
 Kramer, R. C., 20
 Kress, G., 6, 26, 28
 Kristiansen, D. M., 8, 38

 Landis, D., 12
 Leahy, W. R., 10
 Lengermann, J., 21
 Lenzycki, H. P., 42
 Levi, L. R., 29
 Litton Mellonics Systems Development Division, 26
 Lynch, B. A., 20

 Marsh, C. N., Jr., 23, 26
 Matlick, R. K., 26
 McBer and Company, 39
 McCullough, T. J., 35
 McFann Gray & Associates, Inc., 31
 McFarling, L. H., 35
 McGuire, W. J., 6, 26
 Medlin, S. M., 36
 Meerschaert, M., 30, 31
 Miller, E. E., 19
 Mirabella, A., 11, 36
 Montgomery, C. A., 3, 5, 18
 Moses, F. L., 7
 Motowidlo, S. J., 23
 Myers, D. C., 18, 41

 Nogami, G. Y., 39

 O'Brien, R. E., 37, 38
 Onosko, P. W. J., 27, 31, 32
 Operating Systems, Inc., 3, 5, 18
 Orban, J. A., 29
 Osborn, W. C., 5, 37
 Ozkaptan, H., 8, 40

 Pask, G., 28
 Pearlstein, R. B., 11
 Pelligrino, S. J., 14
 Pence, E. C., 29
 Perceptronics, Inc., 4, 7
 Personnel Decisions, Inc., 23
 Pfeiffer, M. G., 40
 Phelps, R. H., 7
 Potash, L. M., 13
 Priest, R. F., 19
 Prince, H. T., II, 19

 Rice, R. W., 19
 Ridsdale, S., 14
 Rigg, K. E., 31
 Root, R. T., 31
 Rouse, S. H., 14, 15
 Rouse, W. B., 14, 15
 Ryan-Jones, D. L., 4, 11

 Samet, M. G., 4, 7
 Schechterman, M. D., 29
 Schendel, J. D., 9
 Segal, D. R., 20, 21, 22
 Sevilla, E. R., 33
 Sgro, J. A., 29
 Shields, J. L., 39
 Shriver, E. L., 16, 27, 33, 34, 35
 Siebold, G. L., 38
 Siegel, A. I., 10, 40
 Simutis, Z. M., 36
 Singer, R. N., 14, 17
 Sitterson, J. D., Jr., 24, 25
 Smutz, E. R., 4
 State University of New York at Buffalo, 19
 Sulzen, R. H., 16, 32
 Swezey, R. W., 11, 26
 System Research, Ltd., 28

 Thompson, J. R., 3, 5, 18
 Thompson, R. C., 20, 21
 Ton, W., 11
 Tzeng, O. C. S., 12

 University of Illinois, 14, 15
 University of Maryland, 20, 21, 22
 U.S. Air Force, 21
 U.S. Military Academy, 19, 20

 VanWert, J. R., 39
 Vector Research, Inc., 4, 28, 30, 31
 Virginia Polytechnic Institute and State University, 29

 Wallis, M. R., 19, 23
 Wanschura, R. G., 35, 36
 Wilson, L. G., 40
 Wintersteen, J. O., 24
 Witus, G., 4, 30, 31
 Wolf, J. J., 10, 40
 Wylie, P. B., 16, 27

 Yeager, R. F., 36
 Yoder, J. D., 19

Subject Areas

aircrew night operations methodology, 17
aptitude measures (basic research), 31
armor crew simulation, 13
armor training & performance, 6, 26

basic research, 20, 21, 22
battlefield information systems, 4

career development, 38
 officer, 23, 24, 25, 26, 29
command & control, 10, 28
computer-based education (basic research), 14, 15
criterion-referenced testing, 11

decision making (basic research), 28

education & training (basic research), 16
educational technology & simulation, 36
engagement simulation training, 16, 27, 31, 32, 33, 34, 35, 36
evaluation technology, 11

Fort Knox, 37, 38, 39

human performance in field assessment, 4
human relations management, 12, 13

intelligence systems, 3, 5, 7, 18
interactive computer systems, 5

job analysis, 18

leadership & management (basic research), 29, 39

maintenance training, 4
manpower & educational systems, 40, 42
map display, 13
motivation & morale, 23
motor skills training (basic research), 14, 17

officer training (basic research), 19

personnel utilization, 41

signal detection, 8
skill retention, 5, 39
soldier productivity (basic research), 20, 38
system-embedded training, 6
system requirements & operations, 30, 31

tactical display systems, 29
tank crewmen training, 37, 38
training, 41
 individual, performance-oriented, 8
 in operational units, 26
 performance-based, 9, 36
 standards & evaluation, 11
 technology, 15, 16
 unit, 19, 28
training device technology, 42

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ATTN: Mrs. Elizabeth N. Seng
University Library, Order
Omaha, Nebraska 68181

NEVADA

21-E University of Nevada Library
ATTN: Steven D. Zink (Doc Ex)
Federal Documents Section
Government Publications Department
Reno, Nevada 89557

NEW HAMPSHIRE

- 28 University of New Hampshire
ATTN: Library Serial Department
Durham, New Hampshire 03824
- 62 Dartmouth College Library
ATTN: Reference Department
Hanover, New Hampshire 03755

NEW JERSEY

- 86 Rutgers University Library
ATTN: Government Publication Department
New Brunswick, New Jersey 08901
- 83 Princeton University Library
ATTN: Document Librarian
Princeton, New Jersey 08540

NEW MEXICO

- 42-C University of New Mexico
ATTN: General Library - GPMD
Charles A. Seavey
Albuquerque, New Mexico 87131

NEW YORK

- 72 Lehman College Library
ATTN: Acquisition Division
Serials Section
Bedford Park Blvd West
Bronx, New York 10468
- 49 Brooklyn College Library
ATTN: Prof. E. Svuksts
Documents Division
Bedford Ave. & Ave. H
Brooklyn, New York 11210

- 79 Brooklyn Public Library
ATTN: Technical Services Center
Acquisitions Department
109 Montgomery Street
Brooklyn, New York 11238
- 5 State University of New York at Buffalo
ATTN: Acquisitions Department
Lockwood Library Annex
Buffalo, New York 14260
- 35 Cornell University Library
ATTN: Government Documents
Ithaca, New York 14853
- 23 Columbia University Libraries
ATTN: Documents Service Center, Rm. 327
420 West 118th Street
New York, New York 10027
- 32 New York City Association of the Bar
ATTN: Library
42 West 44th Street
New York, New York 10036
- 22 New York Public Library
ATTN: Government Documents
Fifth Avenue and 42nd Street
New York, New York 10018
- 108 New York Public Library
ATTN: Book Ordering Office - Periodicals
455 Fifth Avenue
New York, New York 10016
- 16 Paul, Weiss, Rifkind, Wharton & Garrison
ATTN: Library
345 Park Avenue
New York, New York 10154

Readex Microprint Corporation
101 5th Avenue
New York, New York 10003

- 118 New York Law School
Library - Government Documents
57 Worth Street
New York, New York 10013
Attn: Joanne Scala Gov. Docs Asst.

- 24 United Nations
ATTN: Dag Hammarskjold Library
Acquisitions Section
New York, New York 10163
- 21-B John Jay College of Criminal Justice
Library - Acquisitions Department
445 West 59th Street
New York, New York 10019
- 105 State University of New York at Stony Brook
ATTN: Main Library
Documents Section
Stony Brook, New York 11790
- 64 Syracuse University Library
ATTN: Serials Division
Syracuse, New York 13210

NORTH CAROLINA

- 98 University of North Carolina-Chapel Hill
ATTN: Serials Department
Wilson Library 024-A
Chapel Hill, North Carolina 27514
- 12 Duke University Library
ATTN: Documents Librarian
Durham, North Carolina 27706
- 90 North Carolina State University - D.H. Hill Library
ATTN: Acquisitions Dept. (S)
Raleigh, North Carolina 27607

OHIO

- 20-A University of Cincinnati
ATTN: Main Campus Library
Serials Department (Documents)
Cincinnati, Ohio 45221

- 95 Ohio State University Libraries
ATTN: Documents Division
Main Library
1858 Neil Avenue
Columbus, Ohio 43210
- 87 Kent State University
ATTN: Documents Librarian
Kent, Ohio 44240
- 38 Miami University Library
ATTN: Jean Sears, Documents Librarian
Oxford, Ohio 45056
- 41 The College of Wooster
Government Publications Department
Andrews Library
Wooster, Ohio 44691

OKLAHOMA

- 14 Oklahoma State University Library
ATTN: Documents Librarian
Stillwater, Oklahoma 74078

PENNSYLVANIA

- 80 Free Library of Philadelphia
ATTN: Public Documents Department
Logan Square
Philadelphia, Pennsylvania 19103
- 54 Temple University
ATTN: Documents Room
Samuel Paley Library
Philadelphia, Pennsylvania 19122
- 81 Carnegie Library of Pittsburgh
ATTN: Serials Unit
4400 Forbes Avenue
Pittsburgh, Pennsylvania 15213

RHODE ISLAND

77 Brown University
ATTN: Library
Documents Division
Providence, Rhode Island 02912

SOUTH CAROLINA

47 University of South Carolina
ATTN: Order Department
McKissick Memorial Library
Columbia, South Carolina 29208

TENNESSEE

89 University of Tennessee Library
ATTN: Documents Librarian
Knoxville, Tennessee 37916

TEXAS

42-A Texas State Law Library
ATTN: Barbara Jo Seroto
P. O. Box 12367
Austin, Texas 78711

27 University of Texas
ATTN: Documents Librarian
Law Library
2500 Red River
Austin, Texas 78705-5799

34 University of Texas Library
ATTN: Central Serials Record
Austin, Texas 78712

21-J Texas A & M University
ATTN: Jan Swanbeck
Documents Division
Sterling C. Evans Library
College Station, Texas 77843

76 Dallas Public Library
ATTN: Documents Librarian
1515 Young Street
Dallas, Texas 75201

110 Baylor University
Library - Serials Department
P.O. Box 6307
Waco, Texas 76706

UTAH

20 Utah State University UMC-30
ATTN: Leona K Pisarz
Merrill Library - Ordering and Receiving
Logan, Utah 84322

21-D Brigham Young University
ATTN: Library
Documents Section
Provo, Utah 84601

2 University of Utah
ATTN: Serials Order Department
Documents Section
Salt Lake City, Utah 84112

VERMONT

13 University of Vermont
ATTN: Director of Libraries
Guy W. Bailey Library
Burlington, Vermont 05401

VIRGINIA

106 University of Virginia
ATTN: Public Documents
Charlottesville, Virginia 22903

OTHER

3 Bibliotheek Voor
 Hedendaagse Dokumentatie
 Parklaan 2
 B-2700 Sint Nikolaas Waas,
 BELGIUM

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